Hoshizaki

Hoshizaki America, Inc.

Modular Crescent Cuber

Models
KM-320MAH-E
KM-515MAH-E
KM-650MAH-E

"A Superior Degree of Reliability"

SERVICE MANUAL

www.hoshizaki.com

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⚠ WARNING

Only qualified service technicians should install and service the icemaker. To obtain the name and phone number of your local Hoshizaki Certified Service Representative, visit www.hoshizaki-europe.com. No service should be undertaken until the technician has thoroughly read this Service Manual. Failure to service and maintain the icemaker in accordance with this manual will adversely affect safety, performance, component life, and warranty coverage and may result in costly water damage. Proper installation is the responsibility of the installer. Product failure or property damage due to improper installation is not covered under warranty.

Hoshizaki provides this manual primarily to assist qualified service technicians in the service and maintenance of the icemaker. Should the reader have any questions or concerns which have not been satisfactorily addressed, please call the appropriate Hoshizaki Service Office:

UK/Ireland - Hoshizaki UK
TEL : +44 (0)845 456 0585
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Web Site: www.hoshizaki-europe.com

NOTE: To expedite assistance, all correspondence/communication MUST include the following information:

- Model Number ________________________
- Serial Number ________________________
- Complete and detailed explanation of the problem.

IMPORTANT
This manual should be read carefully before the icemaker is serviced. Read the warnings and guidelines contained in this booklet carefully as they provide essential information for the continued safe use, service, and maintenance of the icemaker. Retain this booklet for any further reference that may be necessary.

CONTENTS

Important Safety Information

Throughout this manual, notices appear to bring your attention to situations which could result in death, serious injury, damage to the icemaker, or damage to property.

⚠ **WARNING**	**Indicates a hazardous situation which could result in death or serious injury.**
NOTICE	**Indicates a situation which could result in damage to the icemaker or property.**
IMPORTANT	**Indicates important information about the use and care of the icemaker.**

⚠ WARNING

This icemaker should be destined only to the use for which it has been expressly conceived. Any other use should be considered improper and therefore dangerous. The manufacturer cannot be held responsible for injury or damage resulting from improper, incorrect, and unreasonable use. Failure to service and maintain the icemaker in accordance with this manual will adversely affect safety, performance, component life, and warranty coverage and may result in costly water damage.
To reduce the risk of death, electric shock, serious injury, or fire, follow basic precautions including the following:

- Only qualified service technicians should install and service this icemaker.
- Electrical connection must meet national, state, and local electrical code requirements. Failure to meet these code requirements could result in death, electric shock, serious injury, fire, or severe damage to equipment.
- This icemaker requires an independent power supply of proper capacity. See the nameplate for electrical specifications. Failure to use an independent power supply of proper capacity can result in a tripped breaker, blown fuses, damage to existing wiring, or component failure. This could lead to heat generation or fire.
- **THE ICEMAKER MUST BE EARTHED (GROUNDED). 220-240VAC UK and the Republic of Ireland:** This appliance is equipped with a non-rewirable BSI BS-1363 three-prong 13A fused earthing (grounding) plug to reduce the risk of potential shock hazards. It must be plugged into a properly earthed (grounded), independent 3-prong mains socket. If the mains socket is not compatible, it is your personal responsibility to have a qualified electrician replace it with a properly earthed (grounded), independent, compatible 3-prong mains socket. Do not remove the earth (ground) prong or fuse from the plug and do not use an adapter plug. The BSI BS-1363 three-prong 13A fused earthing (grounding) plug must never be used without a fuse cover being fitted. Failure to follow these instructions may result in death, electric shock, or fire.
- **220-240VAC Continental:** If the power cord and/or non-rewirable plug should need to be fitted or replaced, it should only be done by a qualified service technician. Failure to follow these instructions may result in death, electric shock, or fire.
- To reduce the risk of electric shock, do not touch the control switch or plug with damp hands.

⚠ WARNING, continued

- Before servicing the icemaker, move the control switch to the "OFF" position. Unplug the icemaker from the mains socket.
- Do not use an extension cord.
- Do not use an icemaker with a damaged power cord. The power cord should not be altered, jerked, bundled, weighed down, pinched, or tangled. Such actions could result in electric shock or fire. To unplug the icemaker, be sure to pull the plug, not the cord, and do not jerk the cord.
- The GREEN/YELLOW earth (ground) wire in the factory-installed power cord is connected to the icemaker. If it becomes necessary to remove or replace the power cord, be sure to connect the power cord's earth (ground) wire.
- Do not make any alterations to the icemaker. Alterations could result in electric shock, injury, fire, or damage to the icemaker.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be properly supervised around this appliance.
- Do not climb, stand, or hang on the icemaker or allow children or animals to do so. Serious injury could occur or the icemaker could be damaged.
- Do not use combustible spray or place volatile or flammable substances near the icemaker. They might catch fire.
- Keep the area around the icemaker clean. Dirt, dust, or insects in the icemaker could cause harm to individuals or damage to the icemaker.

NOTICE

- Follow the instructions in this manual carefully to reduce the risk of costly water damage.
- In areas where water damage is a concern, install in a contained area with a floor drain.
- Install the icemaker in a location that stays above freezing. Normal operating ambient temperature must be within 45°F to 100°F (7°C to 38°C).
- Do not leave the icemaker on during extended periods of non-use, extended absences, or in sub-freezing temperatures. To properly prepare the icemaker for these occasions, follow the instructions in "VI.C. Preparing the Icemaker for Periods of Non-Use."
- Do not place objects on top of the icemaker.
- The storage bin is for ice use only. Do not store anything else in the storage bin.

I. Specifications

A. KM-320MAH-E

AC SUPPLY VOLTAGE	220-240/50/1
AMPERAGE	3.5 A (5 Min. Freeze at 109°F/WT 59°F)
MINIMUM CIRCUIT AMPACITY	15 A
MAXIMUM FUSE SIZE	15 A

APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day) Reference without *marks	Ambient Temp. (°F)	WATER TEMP. (°F) 50	70	90
	70	*293 (133)	275 (125)	255 (116)
	80	279 (127)	252 (114)	234 (106)
	90	275 (125)	*232 (105)	213 (97)
	100	273 (124)	228 (103)	196 (89)

FOR THE EUROPEAN MARKET	10/10°C	20/15°C	30/25°C
ICE CAPACITY lbs./day (kg/day)	346 (157)	303 (137)	236 (107)

SHAPE OF ICE	Crescent Cube	
ICE PRODUCTION PER CYCLE	8 lbs. (3.6 kg) 360pcs.	
APPROXIMATE STORAGE CAPACITY	N/A	
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F
ELECTRIC W (kWH/100 lbs.)	710 (7.3)	650(5.3)
WATER gal./24HR (gal./100 lbs.)	52(22.2)	117(40.1)

EXTERIOR DIMENSIONS (WxDxH)	22"x27-3/8"x30-5/16" (560x695x770 mm)	
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)	
WEIGHT	Net 153 lbs. (69 kg), Shipping 175 lbs. (79 kg)	
CONNECTIONS - ELECTRIC	Power Cord - Connection	
- WATER SUPPLY	Inlet	1/2" FPT
- DRAIN	Outlet	3/4" FPT
		3/8" OD Hard Tube
CUBE CONTROL SYSTEM	Float Switch	
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer	
ICE MAKING WATER CONTROL	Timer Controlled. Overflow Pipe	
COOLING WATER CONTROL	N/A	
BIN CONTROL SYSTEM	Thermostatic or Mechanical Bin Control	
COMPRESSOR	Hermetic, Model ASE32C3E-CAZ-254	
CONDENSER	Air-Cooled , Fin and tube type	
EVAPORATOR	Vertical type, Stainless Steel and Copper	
REFRIGERANT CONTROL	Thermostatic Expansion Valve	
REFRIGERANT CHARGE	R404A, 1 lb. 4.3 oz. (575g)	
DESIGN PRESSURE	High 467PSIG, Low 230PSIG	
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-out (Internal)	
COMPRESSOR PROTECTION	Auto-reset Overload Protector (Internal)	
REFRIGERANT CIRCUIT PROTECTION	Auto-reset High Pressure Control Switch	
LOW WATER PROTECTION	Float Switch	
ACCESSORIES -SUPPLIED	N/A	
-REQUIRED	Ice Storage Bin	
OPERATING CONDITIONS	VOLTAGE RANGE	198 - 254 V
	AMBIENT TEMP.	45 -100° F
	WATER SUPPLY TEMP.	45 - 90° F
	WATER SUPPLY PRESSURE	10 - 113 PSIG

Note: We reserve the right to make changes in specifications and design without prior notice.

B. KM-515MAH-E

AC SUPPLY VOLTAGE	220-240/50/1			
AMPERAGE	7.14 A (5 Min. Freeze AT 109°F / WT 59°F)			
MINIMUM CIRCUIT AMPACITY	15A			
MAXIMUM FUSE SIZE	15 A			
APPROXIMATE ICE PRODUCTION	Ambient	WATER TEMP. (°F)		
PER 24 HR.	Temp.(°F)	50	70	90
lbs./day (kg/day)	70	*513 (233)	482 (219)	441 (200)
Reference without *marks	80	490 (222)	442 (200)	401 (182)
	90	482 (219)	*408 (185)	366 (166)
	100	474 (215)	398 (181)	328 (149)
FOR THE EUROPEAN MARKET		10/10°C	21/15°C	30/25°C
ICE CAPACITY lbs./day (kg/day)		582 (264)	528 (239)	406 (184)
SHAPE OF ICE	Crescent Cube			
ICE PRODUCTION PER CYCLE	10.2 lbs. (4.6 kg) 480pcs.			
APPROXIMATE STORAGE CAPACITY	N/A			
ELECTRIC & WATER CONSUMPTION	90/70°F		70/50°F	
ELECTRIC W (kWH/100 lbs.)	1200(7.1)		1080(5.1)	
WATER gal./24HR (gal./100 lbs.)	108(26.5)		159(31.1)	
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 30-5/16" (560 x 695 x 770 mm)			
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)			
WEIGHT	Net 151 lbs. (68 kg), Shipping 175 lbs. (79 kg)			
CONNECTIONS - ELECTRIC	Power Cord - Connection			
- WATER SUPPLY	Inlet 1/2" FPT			
- DRAIN	Outlet 3/4" FPT			
	3/8" OD Hard Tube			
CUBE CONTROL SYSTEM	Float Switch			
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer			
ICE MAKING WATER CONTROL	Time Controlled. Overflow Pipe			
COOLING WATER CONTROL	N/A			
BIN CONTROL SYSTEM	Thermostatic or Mechanical Bin Control			
COMPRESSOR	Hermetic, Model RST64C1E-CAZ-202			
CONDENSER	Air-Cooled , Fin and Tube Type			
EVAPORATOR	Vertical Type, Stainless Steel and Copper			
REFRIGERANT CONTROL	Thermostatic Expansion Valve			
REFRIGERANT CHARGE	R404A, 1 lb. 2.5 oz. L33 (525g)			
DESIGN PRESSURE	High 467PSIG, Low 230PSIG			
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-Out (Internal)			
COMPRESSOR PROTECTION	Auto-Reset Protector (Internal)			
REFRIGERANT CIRCUIT PROTECTION	Auto-Reset High-Pressure Switch			
LOW WATER PROTECTION	Float Switch			
ACCESSORIES -SUPPLIED	N/A			
-REQUIRED	Ice Storage Bin			
OPERATING CONDITIONS	VOLTAGE RANGE			198-254VAC
	AMBIENT TEMP.			45 -100° F
	WATER SUPPLY TEMP.			45 - 90° F
	WATER SUPPLY PRESSURE			10 - 113 PSIG

Note: We reserve the right to make changes in specifications and design without prior notice.

C. KM-650MAH-E

AC SUPPLY VOLTAGE	220-240/50/1
AMPERAGE	6.8 A (5 Min. Freeze AT 109°F / WT 59°F)
MINIMUM CIRCUIT AMPACITY	15 A
MAXIMUM FUSE SIZE	15 A

APPROXIMATE ICE PRODUCTION PER 24 HR. lbs./day (kg/day) Reference without *marks	Ambient Temp.(°F)	WATER TEMP. (°F) 50	70	90
	70	*653 (296)	610 (277)	558 (253)
	80	620 (281)	554 (251)	506 (229)
	90	610 (277)	*507 (230)	456 (207)
	100	602 (273)	495 (225)	409 (186)

FOR THE EUROPEAN MARKET	10/10°C	20/15°C	30/25°C
ICE CAPACITY lbs./day (kg/day)	734 (333)	603 (274)	535 (243)

SHAPE OF ICE	Crescent Cube	
ICE PRODUCTION PER CYCLE	14 lbs. (6.4 kg) 720pcs.	
APPROXIMATE STORAGE CAPACITY	N/A	
ELECTRIC & WATER CONSUMPTION	90/70°F	70/50°F
ELECTRIC W (kWH/100 lbs.)	1200(5.7)	1090(4.0)
WATER gal./24HR (gal./100 lbs.)	94(18.5)	162(24.8)

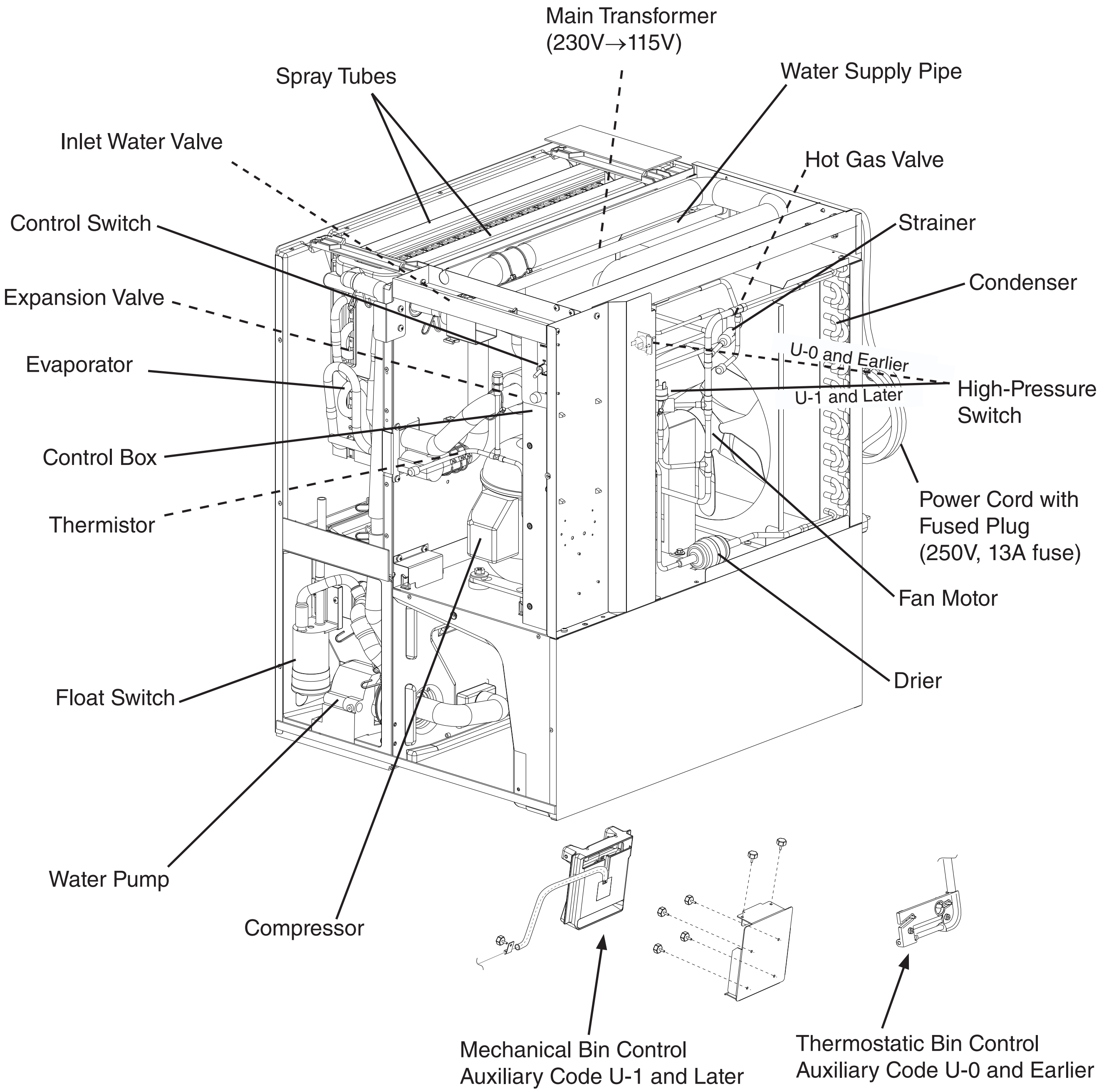
EXTERIOR DIMENSIONS (WxDxH)	22" x 27-3/8" x 37-7/16" (560 x 695 x 950 mm)	
EXTERIOR FINISH	Stainless Steel, Galvanized Steel (Rear)	
WEIGHT	Net 169 lbs. (77 kg), Shipping 200 lbs. (91 kg)	
CONNECTIONS - ELECTRIC	Power Cord - Connection	
- WATER SUPPLY	Inlet	1/2" FPT
- DRAIN	Outlet	3/4" FPT
		3/8" OD Hard Tube
CUBE CONTROL SYSTEM	Float Switch	
HARVESTING CONTROL SYSTEM	Hot Gas and Water, Thermistor and Timer	
ICE MAKING WATER CONTROL	Time Controlled. Overflow Pipe	
COOLING WATER CONTROL	N/A	
BIN CONTROL SYSTEM	Thermostatic or Mechanical Bin Control	
COMPRESSOR	Hermetic, Model RST64C1E-CAZ-202	
CONDENSER	Air-Cooled , Fin and Tube Type	
EVAPORATOR	Vertical Type, Stainless Steel and Copper	
REFRIGERANT CONTROL	Thermostatic Expansion Valve	
REFRIGERANT CHARGE	R404A, 1 lb. 6.6 oz. (640g)	
DESIGN PRESSURE	High 467PSIG, Low 230PSIG	
P.C. BOARD CIRCUIT PROTECTION	High Voltage Cut-Out (Internal)	
COMPRESSOR PROTECTION	Auto-Reset Protector (Internal)	
REFRIGERANT CIRCUIT PROTECTION	Auto-Reset High-Pressure Switch	
LOW WATER PROTECTION	Float Switch	
ACCESSORIES -SUPPLIED	N/A	
-REQUIRED	Ice Storage Bin	
OPERATING CONDITIONS	VOLTAGE RANGE	198-254VAC
	AMBIENT TEMP.	45 -100° F
	WATER SUPPLY TEMP.	45 - 90° F
	WATER SUPPLY PRESSURE	10 - 113 PSIG

Note: We reserve the right to make changes in specifications and design without prior notice.

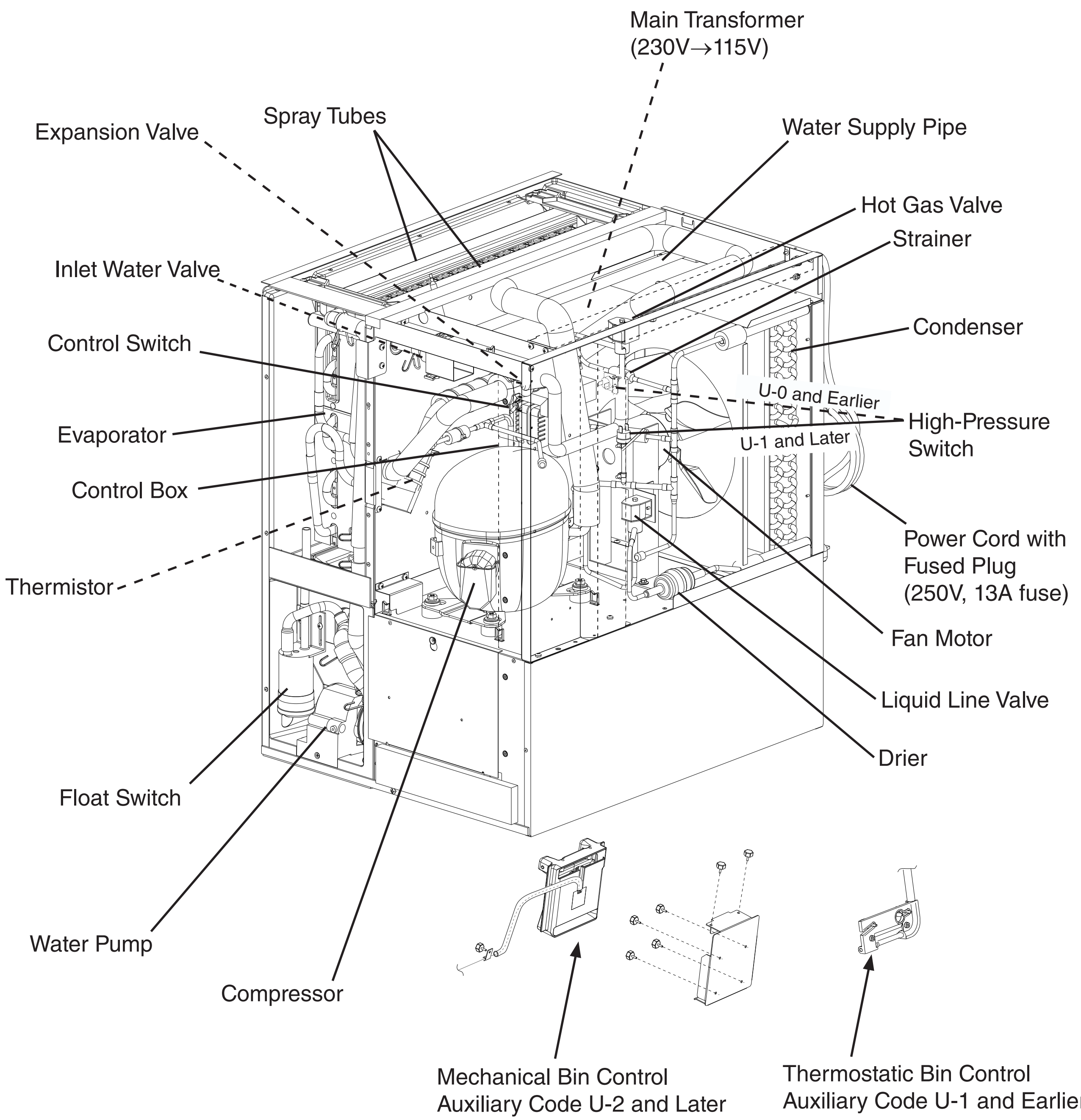
II. General Information

A. Construction

1. KM-320MAH-E

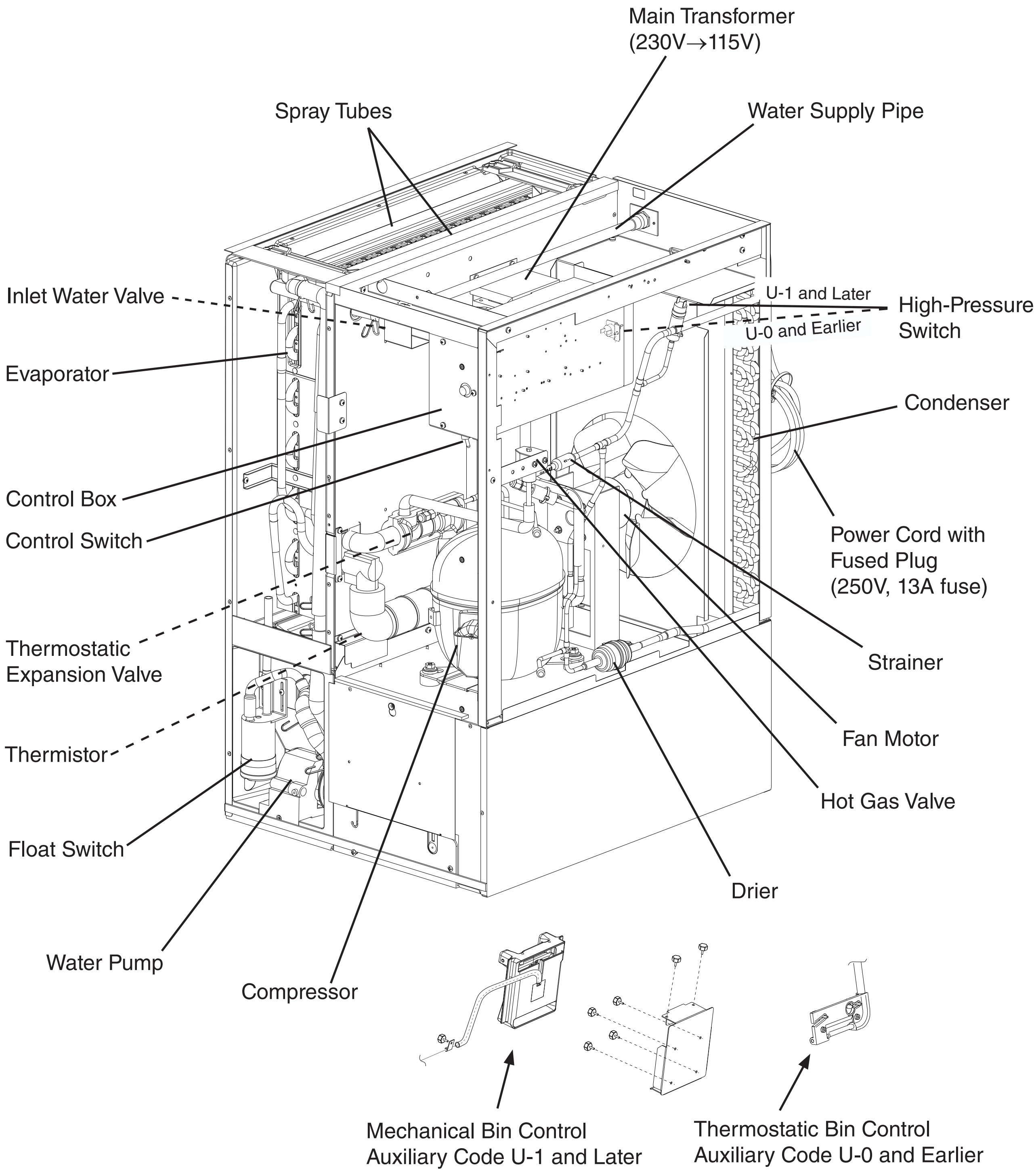


2. KM-515MAH-E



Main Transformer
(230V→115V)
Spray Tubes
Expansion Valve
Water Supply Pipe
Hot Gas Valve
Strainer
Inlet Water Valve
Condenser
Control Switch
U-0 and Earlier
High-Pressure
Switch
U-1 and Later
Evaporator
Control Box
Power Cord with
Fused Plug
(250V, 13A fuse)
Thermistor
Fan Motor
Liquid Line Valve
Drier
Float Switch
Water Pump
Compressor
Mechanical Bin Control
Auxiliary Code U-2 and Later
Thermostatic Bin Control
Auxiliary Code U-1 and Earlier

3. KM-650MAH-E



Main Transformer
(230V→115V)
Spray Tubes
Water Supply Pipe
Inlet Water Valve
U-1 and Later
U-0 and Earlier
High-Pressure
Switch
Evaporator
Condenser
Control Box
Control Switch
Power Cord with
Fused Plug
(250V, 13A fuse)
Thermostatic
Expansion Valve
Strainer
Thermistor
Fan Motor
Hot Gas Valve
Float Switch
Drier
Water Pump
Compressor
Mechanical Bin Control
Auxiliary Code U-1 and Later
Thermostatic Bin Control
Auxiliary Code U-0 and Earlier

B. Sequence of Operation

1. Sequence Cycles and Shutdown

a) "E" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier

KM-515MAH-E Auxiliary Code U-1 and Earlier

The steps in the sequence are as outlined below. When power is supplied, CB red "POWER OK" LED comes on. There is a 5-second delay before startup. Note that the order of the component LEDs from the outer edge of CB is 1, 4, 3, 2.

(1) 1-Minute Fill Cycle

LED 4 is on. WV energizes and the fill period begins. After 1 minute, CB checks for a closed F/S. If F/S is closed, the harvest cycle begins. If not, WV remains energized through additional 1-minute fill cycles until water enters the water tank and F/S closes. This serves as a low water safety to protect PM.

(2) Initial Harvest Cycle

LEDs 1, 4, and 2 are on. WV remains energized, Comp and HGV energize. CB monitors the warming of the evaporator via the thermistor located on the suction line. When the thermistor reaches 48°F (9°C), CB reads 3.9 kΩ from the thermistor and turns harvest termination over to the adjustable harvest timer (S4 dip switch 1 & 2). The harvest timer has settings of 60, 90, 120, and 180 seconds. The pump-out timer (S4 dip switch 3 & 4) acts in place of the harvest timer during cycles with a pump-out (S4 dip switch 5 & 6). WV is energized during harvest for a maximum of 6 minutes or the length of harvest, whichever is shorter. LED 4 turns off when WV de-energizes. The minimum total time allowed by CB for a complete harvest cycle is 2 minutes. At the end of harvest, CB checks position of F/S and proceeds to the freeze cycle if it is closed or calls for a 1-minute fill if it is open.

(3) Freeze Cycle

LED 1 is on. Comp remains energized, PM, FM, and LLV (KM-515MAH-E) energize. HGV and WV de-energize. For the first 5 minutes, CB will not terminate the freeze cycle. This minimum 5-minute freeze time is short cycle protection for Comp. As ice builds on the evaporator, the water level in the water tank lowers. Freeze continues until F/S opens, provided the 5-minute minimum freeze timer has terminated.

(4) Pump-Out Cycle

LEDs 1, 3, and 2 are on. Comp remains energized. HGV energizes. WV energizes if S4 dip switch 3 off and 4 on (LED 4 on). LLV (KM-515MAH-E) and FM de-energize. PM stops for 2 seconds then reverses for 10 or 20 seconds (S4 dip switch 3 & 4). Water is removed from the bottom of the water tank through the check valve and down the drain. At the same time, water flows through the small F/S tube to power flush F/S. When the pump-out timer terminates, pump-out is complete.

The 1st pump-out occurs after the 1st freeze cycle, then every 10th cycle thereafter (KM-320MAH-E) or every cycle thereafter (KM-515MAH-E and KM-650MAH-E). The pump-out frequency control is factory set, and generally no adjustment is required. However, the pump-out frequency control (S4 dip switch 5 & 6) can be set to have a pump-out occur every cycle, or every 2, 5, or 10 cycles. For details, see "II.C.3.d) Pump-Out Frequency Control (S4 dip switch 5 & 6)."

(5) Harvest Cycle

LEDs 1, 4, and 2 are on. Same as the initial harvest cycle. See "II.B.1.a)(2) Initial Harvest Cycle."

Note: Icemaker continues to cycle until TBC is satisfied or power is turned off. The icemaker always restarts at the 1-minute fill cycle.

(6) Shutdown

When ice contacts the thermostatic bulb (TBC switch open), TBC shuts down the icemaker within 10 seconds. TBC is factory set, and generally no adjustment is required. However, adjustment may be needed in some conditions, particularly at higher altitude locations. ***NOTICE!*** **Do not adjust S4 dip switch 7 out of the factory default position. This dip switch must be left in the factory default position or this icemaker will not operate correctly.**

Legend: **CB**–control board; **Comp**–compressor; **FM**–fan motor; **F/S**–float switch; **HGV**–hot gas valve; **LLV**–liquid line valve (KM-515MAH-E); **PM**–pump motor; **TBC**–thermostatic bin control; **WV**–inlet water valve

b) "G" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later

KM-515MAH-E Auxiliary Code U-2 and Later

The steps in the sequence are as outlined below. When power is supplied, the red "POWER OK" LED and the green "BC CLOSED" LED on CB turn on (If yellow "BC OPEN" LED is on, the icemaker will not start. In this case clear ice away from BC actuator paddle in the storage bin area). A 5-second delay occurs at startup. Note that the order of the green sequence LEDs from the outer edge of the board is 1, 4, 3, 2.

(1) 1-Minute Fill Cycle

LED 4 is on. WV energizes and the fill period begins. After 1 minute, CB checks for a closed F/S. If F/S is closed, the harvest cycle begins. If not, WV remains energized through additional 1-minute fill cycles until water enters the water tank and F/S closes. This serves as a low water safety to protect PM.

(2) Initial Harvest Cycle

LEDs 1, 4, and 2 are on. WV remains energized, Comp and HGV energize. CB monitors the warming of the evaporator via the thermistor located on the suction line. When the thermistor reaches 48°F (9°C), CB reads 3.9 kΩ from the thermistor and turns harvest termination over to the adjustable harvest timer (S4 dip switch 1 & 2). The harvest timer has settings of 60, 90, 120, and 180 seconds. The pump-out timer (S4 dip switch 3 & 4) acts in place of the harvest timer during cycles with a pump-out (S4 dip switch 5 & 6). WV is energized during harvest for a maximum of 6 minutes or the length of harvest, whichever is shorter. ***NOTICE!*** **Do not adjust S4 dip switch 7 out of the factory default position. This dip switch must be left in the factory default position or this icemaker will not operate correctly.** For details, see "II.C.3.e) Bin Control Selector/Harvest Pump Timer (S4 dip switch 7)." LED 4 turns off when WV de-energizes. The minimum total time allowed by CB for a complete harvest cycle is 2 minutes. At the end of harvest, CB checks position of F/S and proceeds to the freeze cycle if it is closed or calls for a 1-minute fill if it is open.

(3) Freeze Cycle

LED 1 is on. Comp remains energized, PM, FM, and LLV (KM-515MAH-E) energize. HGV and WV de-energize. For the first 5 minutes, CB will not terminate the freeze cycle. At the end of 5 minutes, F/S assumes control of the freeze cycle. As ice builds on the evaporator, the water level in the water tank lowers. Freeze continues until F/S opens, provided the 5-minute minimum freeze timer has terminated. There is a 15 second delay before CB acknowledges an open F/S.

(4) Pump-Out Cycle

LEDs 1, 3, and 2 are on. Comp remains energized. HGV energizes. WV energizes if S4 dip switch 3 off and 4 on (LED 4 on). LLV (KM-515MAH-E) and FM de-energize. PM stops for 2 seconds then reverses for 10 or 20 seconds (S4 dip switch 3 & 4). Water is removed from the bottom of the water tank through the check valve and down the drain. At the same time, water flows through the small F/S tube to power flush F/S. When the pump-out timer terminates, pump-out is complete.

The 1st pump-out occurs after the 11th freeze cycle, then every 10th cycle thereafter (KM-320MAH-E) or every cycle thereafter (KM-515MAH-E and the KM-650MAH-E). The pump-out frequency control is factory set, and generally no adjustment is required. However, the pump-out frequency control (S4 dip switch 5 & 6) can be set to have a pump-out occur every cycle, or every 2, 5, or 10 cycles. For details, see "II.C.3.d) Pump-Out Frequency Control (S4 dip switch 5 & 6)."

"G" Control Board Settings			
S4 Dip Switch Setting		Pump-Out Frequency	1st Pump-Out
No. 5	No. 6		
OFF	OFF	Every cycle	After 2nd freeze cycle
ON	OFF	Every 2 cycles	After 3rd freeze cycle
OFF	ON	Every 5 cycles	After 6th freeze cycle
ON	ON	Every 10 cycles	After 11th freeze cycle

(5) Harvest Cycle

LEDs 1, 4, and 2 are on. Same as the initial harvest cycle. See "II.B.1.b)(2) Initial Harvest Cycle."

Note: Icemaker continues to cycle until MBC is satisfied or power is turned off. The icemaker always restarts at the 1-minute fill cycle.

(6) Shutdown

When MBC is activated (MBC open), the yellow "BC OPEN" LED comes on. The icemaker then shuts down as outlined in the table below.

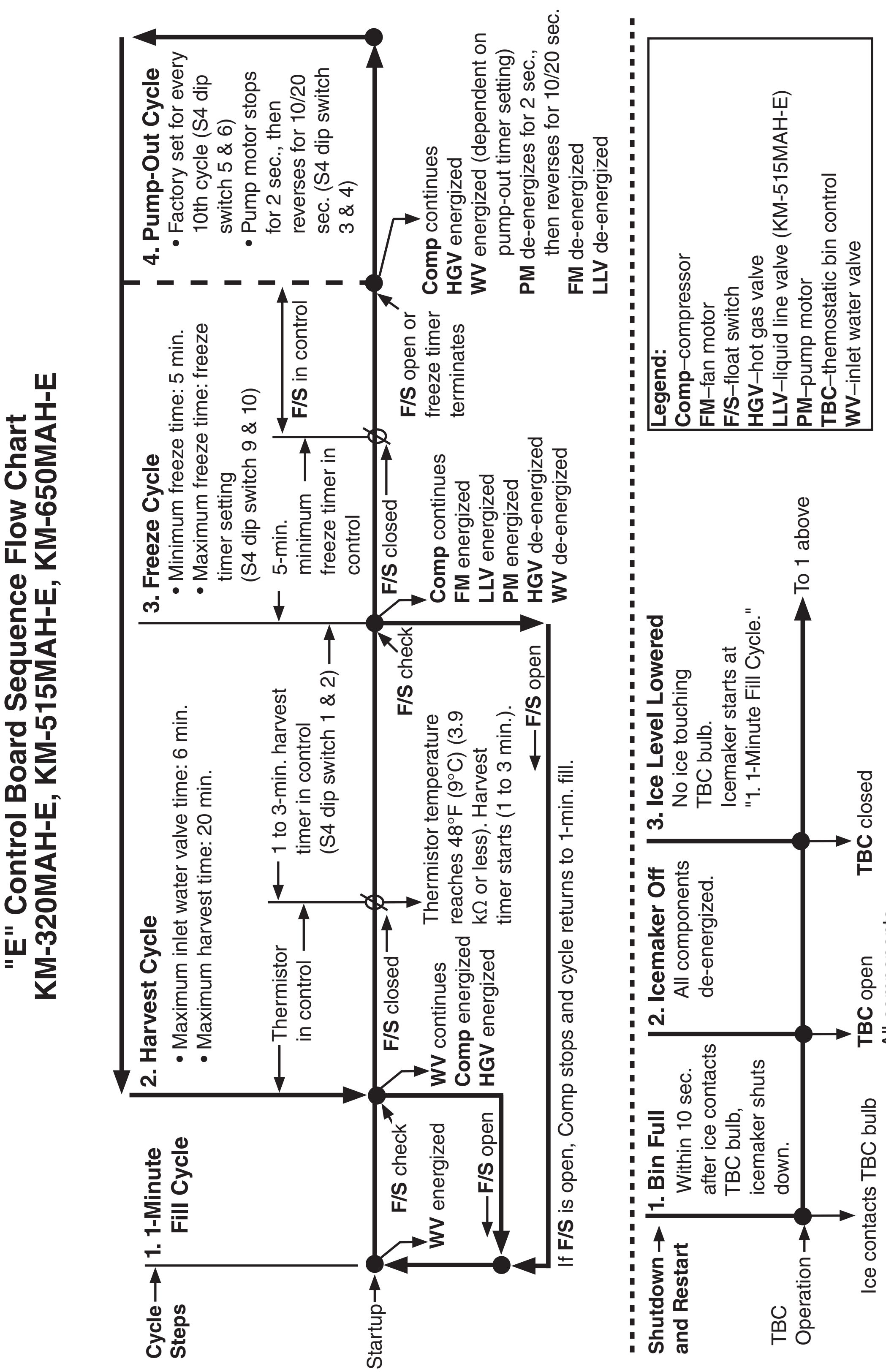
Cycle at Mechanical Bin Control Activation	Shutdown
Fill Cycle	15 seconds after activation.
Harvest Cycle	At the end of the harvest cycle, or up to 15 seconds into the freeze cycle if activated at the end of the harvest cycle.
Freeze Cycle	15 seconds after activation if activated at least 15 seconds before the 5-minute short cycle protection timer terminates. Otherwise, at the end of the next harvest cycle.

Legend: **CB**–control board; **Comp**–compressor; **FM**–fan motor; **F/S**–float switch; **HGV**–hot gas valve; **LLV**–liquid line valve (KM-515MAH-E); **MBC**–mechanical bin control; **PM**–pump motor; **WV**–inlet water valve

2. Sequence Flow Chart

a) "E" Control Board:

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier
KM-515MAH-E Auxiliary Code U-1 and Earlier



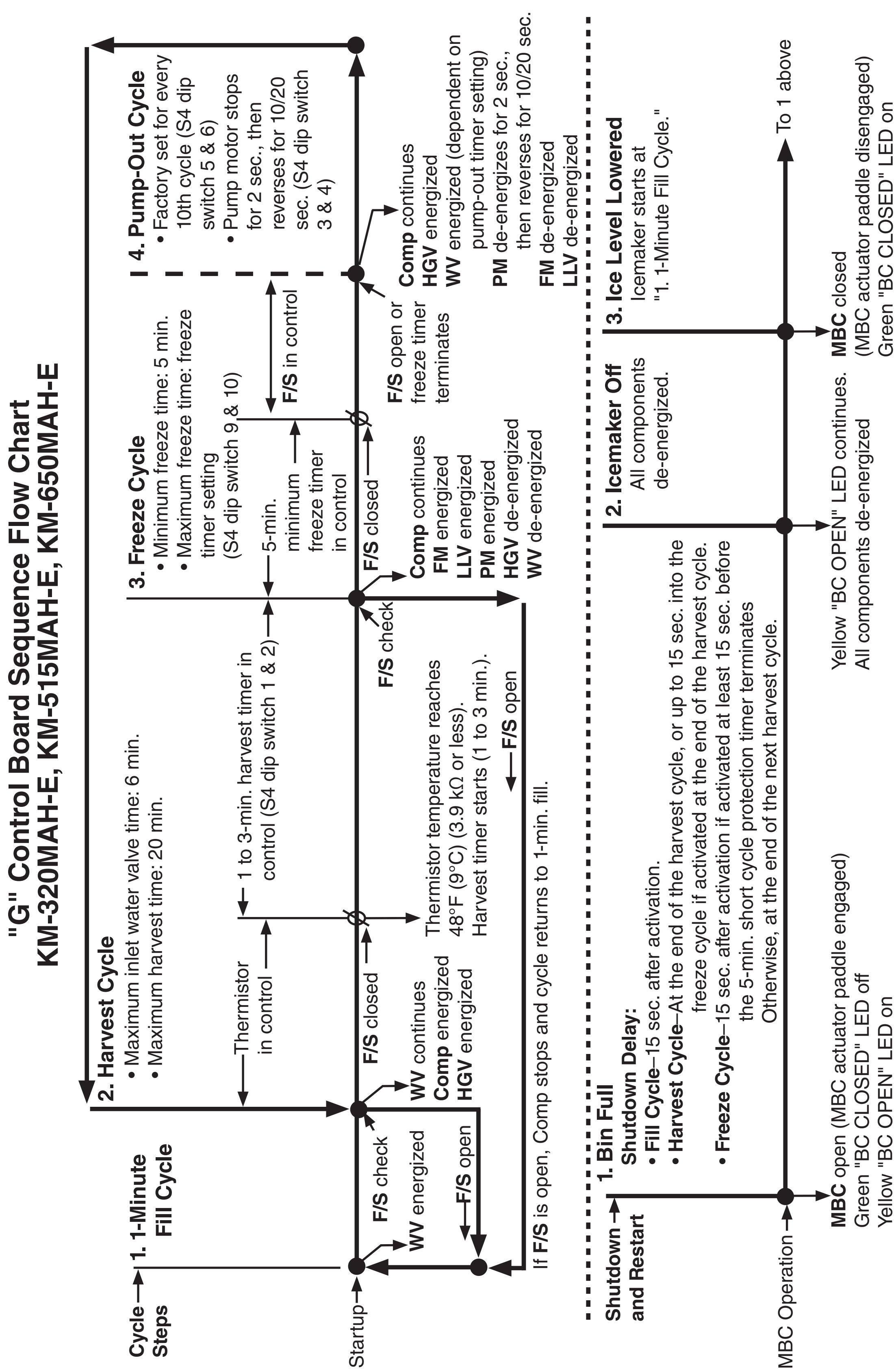
Components Energized when the Control Switch is in the "WASH" Position

The "WASH" position on the control switch is used when cleaning and sanitizing the icemaker. When in the "WASH" position, power is supplied to the pump motor. With the cleaning valve closed, the cleaner and sanitizer flow over the outside of the evaporator plate assembly. With the cleaning valve open, the cleaner and sanitizer flow over both the outside and the inside of the evaporator plate assembly.

Note: Close the cleaning valve after cleaning and sanitizing are complete, otherwise the icemaker will not restart when the control switch is placed in the "ICE" position.

b) "G" Control Board:

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later
KM-515MAH-E Auxiliary Code U-2 and Later



Legend:
Comp–compressor
FM–fan motor
F/S–float switch
HGV–hot gas valve
LLV–liquid line valve (KM-515MAH-E)
MBC–mechanical bin control
PM–pump motor
WV–inlet water valve

Components Energized when the Control Switch is in the "WASH" Position

The "WASH" position on the control switch is used when cleaning and sanitizing the icemaker. When in the "WASH" position, power is supplied to the pump motor. With the cleaning valve closed, the cleaner and sanitizer flow over the outside of the evaporator plate assembly. With the cleaning valve open, the cleaner and sanitizer flow over both the outside and the inside of the evaporator plate assembly.

Note: Close the cleaning valve after cleaning and sanitizing are complete, otherwise the icemaker will not restart when the control switch is placed in the "ICE" position.

C. Control Board

- A Hoshizaki exclusive control board is employed in Hoshizaki icemakers.
- All models are pretested and factory adjusted.
- For a control board check procedure, see "IV.B. Control Board Check."

NOTICE
• Fragile, handle very carefully. • The control board contains integrated circuits, which are susceptible to failure due to static discharge. It is especially important to touch the metal part of the icemaker when handling or replacing the control board. • Do not touch the electronic devices on the control board or the back of the control board. • Do not change wiring and connections. Do not misconnect terminals. • Do not short out power supply to test for voltage. • Always replace the whole control board assembly if it goes bad.

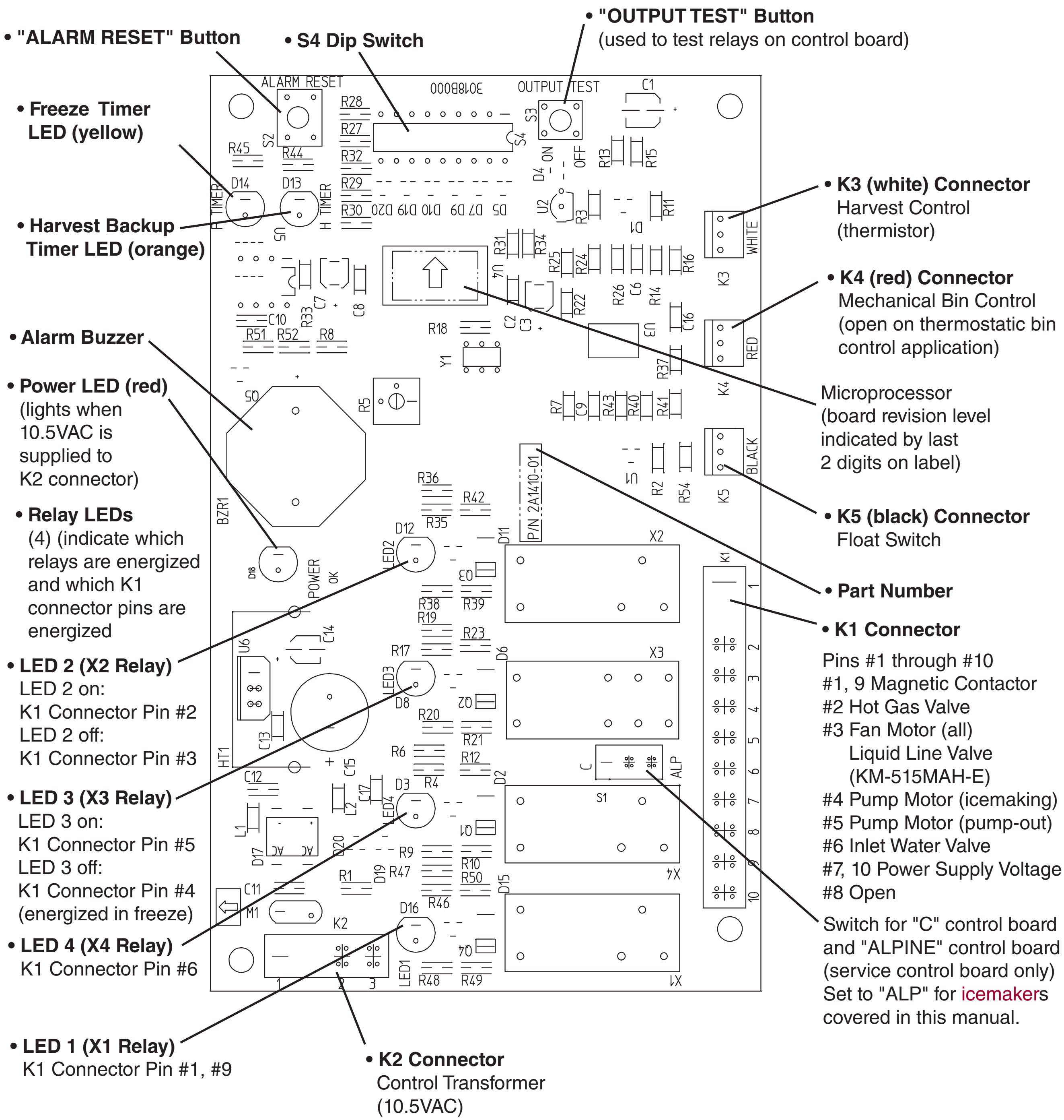
1. Control Board Layout

a) "E" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier

KM-515MAH-E Auxiliary Code U-1 and Earlier

"E" Control Board

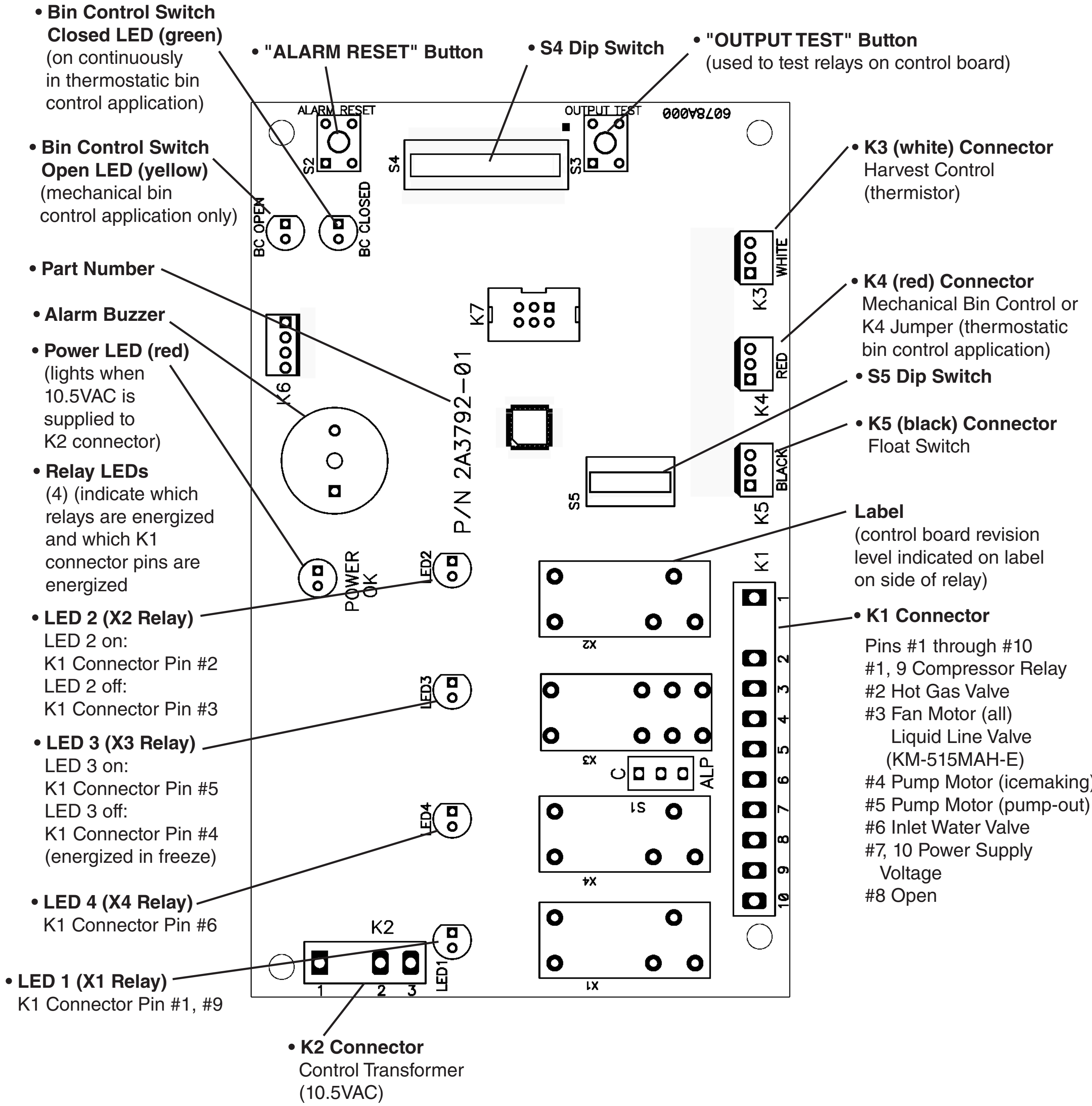


"E" Control Board	
Part Number	2A1410-02

b) "G" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later
KM-515MAH-E Auxiliary Code U-2 and Later

"G" Control Board



"G" Control Board	
Part Number	2A3792-01

2. LED Lights and Audible Alarm Safeties

a) "E" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier

KM-515MAH-E Auxiliary Code U-1 and Earlier

At startup, a 5-second delay occurs while the control board conducts an internal timer check. A beep occurs when power is turned off. The red LED indicates proper control voltage and remains on unless a control voltage problem occurs. The green LEDs 1 through 4 energize and sequence from initial startup as listed in the table below. Note that the order of the LEDs from the outer edge of the control board is 1, 4, 3, 2. For details, see "II.B.1.a) "E" Control Board."

Sequence Step	LED	Energized Components	Time LEDs are On		
			Min.	Max.	Avg.
1-Minute Fill Cycle	4	WV			1 minute
Harvest Cycle	1, 4, 2	Comp, FMR, HGV, WV	2 minutes	20 minutes	3 to 5 minutes
Freeze Cycle	1	Comp, FM/FMR, PM LLV (KM-515MAH-E)	5 minutes	freeze timer setting	30 to 35 minutes
Pump-Out Cycle	1, 4*, 3, 2	Comp, FMR, HGV, PM, WV*	10 seconds	20 seconds	*pump-out timer setting

The built in safeties shut down the icemaker and have alarms as listed below.

No. of Beeps (every 3 sec.)	Type of Alarm	Notes
1	High Evaporator Temp. (temperature > 127°F) (53°C)	Check for harvest problem (stuck HGV or relay), hot water entering icemaker, or shorted thermistor.
2	Harvest Backup Timer (harvest > 20 min. for two cycles in a row)	Orange LED marked H TIMER lights up. Check for open thermistor, HGV not opening, TXV or LLV leaking by, low charge, or inefficient Comp.
3	Freeze Timer (freeze > specified setting for two cycles in a row)	Yellow LED marked F TIMER lights up. Check for F/S stuck closed (up), WV leaking by, HGV leaking by, PM not pumping, TXV not feeding properly, LLV not opening, low charge, or inefficient Comp.
To reset the above safeties, press the "ALARM RESET" button with the power supply on.		
6	Low Voltage (92Vac±5% or less)	Red LED will turn off if voltage protection operates. The control voltage safeties automatically reset when voltage is corrected.
7	High Voltage (147Vac±5% or more)	

Legend: **Comp**–compressor; **FM**–fan motor; **FMR**–fan motor remote; **F/S**–float switch; **HGV**–hot gas valve; **LLV**–liquid line valve (KM-515MAH-E); **PM**–pump motor; **TXV**–thermostatic expansion valve; **WV**–inlet water valve

b) "G" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later

KM-515MAH-E Auxiliary Code U-2 and Later

At startup, a 5-second delay occurs while the control board conducts an internal timer check. A beep occurs when the control switch is moved to the "ICE" position. The red LED indicates proper control voltage and remains on unless a control voltage problem occurs. The green LEDs 1 through 4 energize and sequence from initial startup as listed in the table below. Note that the order of the LEDs from the outer edge of the control board is 1, 4, 3, 2. For details, see "II.B.1.b) "G" Control Board."

Sequence Step	LED	Energized Components	Time LEDs are On		
			Min.	Max.	Avg.
1-Minute Fill Cycle	4	WV			1 minute
Harvest Cycle	1, 4, 2	Comp, FMR, HGV, WV	2 minutes	20 minutes	3 to 5 minutes
Harvest Pump Timer (not used on these models)	1, 3, 2	Comp, FMR, HGV, PM	0 seconds	50 seconds	harvest pump timer setting
Freeze Cycle	1	Comp, FM/FMR, PM, LLV (KM-515MAH-E)	5 minutes	freeze timer setting	30 to 35 minutes
Pump-Out Cycle	1, 4*, 3, 2	Comp, FMR, HGV, PM, WV*	10 seconds	20 seconds	*pump-out timer setting

The built-in safeties shut down the icemaker and have alarms as listed below.

No. of Beeps (every 3 sec.)	Type of Alarm	Notes
1	High Evaporator Temp. (temperature > 127°F) (53°C)	Check for harvest problem (stuck HGV or relay), hot water entering icemaker, or shorted thermistor.
2	Harvest Backup Timer (harvest > 20 min. for two cycles in a row)	Check for open thermistor, HGV not opening, TXV or LLV leaking by, low charge, or inefficient Comp.
3	Freeze Timer (freeze > freeze timer setting for two cycles in a row)	Check for F/S stuck closed (up), WV leaking by, HGV leaking by, PM not pumping, TXV not feeding properly, LLV not opening, low charge, or inefficient Comp.
To reset the above safeties, press the "ALARM RESET" button with the power supply on.		
6	Low Voltage (92Vac±5% or less)	Red LED turns off if voltage protection operates. The control voltage safeties automatically reset when voltage is corrected.
7	High Voltage (147Vac±5% or more)	

Legend: **Comp**–compressor; **FM**–fan motor; **FMR**–fan motor remote; **F/S**–float switch; **HGV**–hot gas valve; **LLV**–liquid line valve (KM-515MAH-E); **PM**–pump motor; **TXV**–thermostatic expansion valve; **WV**–inlet water valve

3. Controls and Adjustments

NOTICE
Dip switches are factory set. Failure to maintain factory settings may adversely affect performance and warranty coverage. For more information, contact your Hoshizaki Service Center.

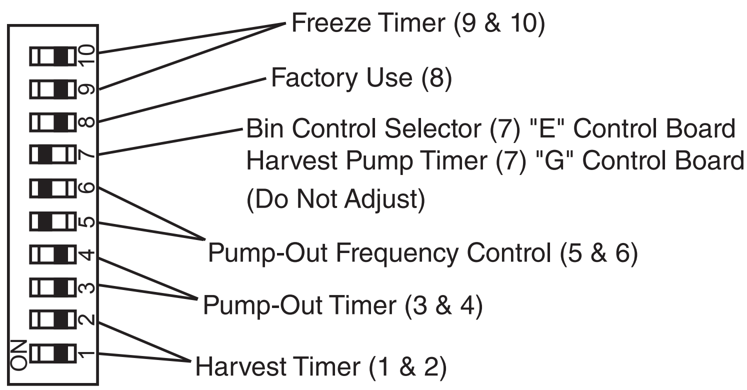
a) Default Dip Switch Settings

The dip switches are factory-adjusted to the following positions for both the "E" and "G" control boards:

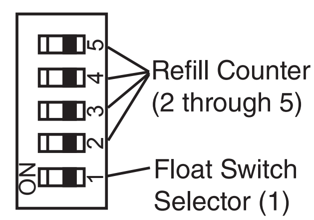
S4 Dip Switch No.	1	2	3	4	5	6	7	8	9	10
KM-320MAH-E	ON	OFF	OFF	ON	ON	ON	OFF	OFF	ON	ON
KM-515MAH-E	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
KM-650MAH-E	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON

S5 Dip Switch (Do Not Adjust) "G" Control Board					
Dip Switch No.	1	2	3	4	5
KM-320MAH-E KM-515MAH-E KM-650MAH-E	OFF	OFF	OFF	OFF	OFF

S4 Dip Switch
"E" and "G" Control Boards



S5 Dip Switch
"G" Control Board Only
Do Not Adjust



b) Harvest Timer (S4 dip switch 1 & 2)

The harvest timer starts counting when the thermistor reaches 48°F (9°C) at the evaporator outlet and the control board reads 3.9 kΩ from the thermistor. The harvest timer is factory set, and generally no adjustment is required. However, a setting longer than the factory setting may be advised in cases where the flush provided at harvest needs to be prolonged for extra cleaning. Before changing this setting, contact your Hoshizaki Service Office for recommendations. Keep in mind that setting the harvest timer to a longer setting decreases 24-hour production.

Note that the pump-out timer (S4 dip switch 3 & 4) acts in place of the harvest timer during cycles with a pump out. For details, see "II.C.3.c) Pump-Out Timer (S4 dip switch 3 & 4)." On KM-515MAH-E and KM-650MAH-E models, the harvest timer is only relevant during the initial harvest cycle since a pump out occurs every cycle thereafter.

S4 Dip Switch Setting		**Time (seconds)**
No. 1	**No. 2**	
OFF	OFF	60
ON	OFF	90
OFF	ON	120
ON	ON	180

c) Pump-Out Timer (S4 dip switch 3 & 4)

NOTICE

On KM-515MAH-E and KM-650MAH-E models, never adjust the pump-out timer's harvest timer (T2) for a time less than 150 seconds. Otherwise, the icemaker will not perform properly.

When a pump-out is called for, the pump motor de-energizes after the preceding freeze cycle. The pump motor energizes 2 seconds later in the reverse direction, taking water from the bottom of the water tank and forcing pressure against the check valve seat allowing water to go through the check valve and down the drain. At the same time, water flows through the small tube to power flush the float switch. The pump motor drains the water tank for the time determined by the pump-out timer. The pump-out timer also acts in place of the harvest timer during cycles with a pump-out. The pump-out timer is factory set, and generally no adjustment is required. However, where water quality is bad and the icemaker needs a longer pump-out time, the pump-out timer can be adjusted. The pump-out timer control can be set to pump-out for 10 or 20 seconds.

S4 Dip Switch Setting		**Time (seconds)**		**Inlet Water Valve**
No. 3	**No. 4**	**T1**	**T2**	
OFF	OFF	10	150	Closed
ON	OFF	10	180	Closed
OFF	ON	10	120	Open
ON	ON	20	180	Closed

T1: Time to drain the water tank

T2: Harvest timer at pump out

d) Pump-Out Frequency Control (S4 dip switch 5 & 6)

NOTICE
On KM-515MAH-E and KM-650MAH-E models: Do not adjust. Adjustments to this setting may adversely affect performance and warranty coverage.

The pump-out frequency control is factory set to drain the water tank every 10 cycles on the KM-320MAH-E and every cycle on the KM-515MAH-E and the KM-650MAH-E, and generally no adjustment is required. However, where water quality is bad and the icemaker needs a pump-out more often, the pump-out frequency can be adjusted. The pump-out frequency control can be set to have a pump-out occur every cycle, or every 2, 5, or 10 cycles.

Timing of the first pump-out is dependent on the control board. "E" control board first pump-out is after the first freeze cycle. "G" control board first pump-out is dependent on S4 dip switch 5 & 6. See the table below.

"E" & "G" Control Board			1st Pump-Out	
S4 Dip Switch Setting		Pump-Out Frequency	"E" Control Board	"G" Control Board
No. 5	No. 6			
OFF	OFF	Every cycle	After 1st freeze cycle	After 2nd freeze cycle
ON	OFF	Every 2 cycles		After 3rd freeze cycle
OFF	ON	Every 5 cycles		After 6th freeze cycle
ON	ON	Every 10 cycles		After 11th freeze cycle

e) Bin Control Selector/Harvest Pump Timer (S4 dip switch 7)

Depending on the control board, S4 dip switch 7 is either a bin control selector or harvest pump timer.

NOTICE
Do not adjust. This dip switch must be left in the factory default position or this icemaker will not operate correctly.

(1) Bin Control Selector, "E" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier

KM-515MAH-E Auxiliary Code U-1 and Earlier

Factory set for proper operation. Do not adjust. When set to the on position on a icemaker with a thermostatic bin control, a 5-beep alarm sounds (open circuit) and the icemaker does not operate.

"E" Control Board	
S4 Dip Switch Setting	Bin Control
No. 7	
ON	Mechanical
OFF	Thermostatic

(2) Harvest Pump Timer, "G" Control Board

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later

KM-515MAH-E Auxiliary Code U-2 and Later

Factory set for proper operation. Do not adjust. Depending on the harvest pump timer setting, the pump motor energizes and runs the last 0 or 50 seconds of harvest. The water valve is energized during harvest for a maximum of 6 minutes or the length of harvest minus 0 or 50 seconds (determined by the harvest pump timer setting), whichever is shorter. ***NOTICE!*** **Do not adjust S4 dip switch 7 out of the factory default position on this model. This dip switch must be left in the factory default position or this icemaker will not operate correctly.**

"G" Control Board	
S4 Dip Switch Setting	**Pump Motor Time (seconds)**
No. 7	
ON	50
OFF	0

f) Factory Use (S4 dip switch 8)

Factory set for proper operation. Do not adjust. This must be left in the factory default position.

g) Freeze Timer (S4 dip switch 9 & 10)

NOTICE
Adjust to proper specification, or the icemaker may not operate correctly.

The freeze timer setting determines the maximum allowed freeze time to prevent possible freeze-up issues. Upon termination of the freeze timer, the control board initiates the harvest cycle. After 2 consecutive timer terminations, the control board shuts the icemaker down. In this case, see "IV.F.3. Low Ice Production" for possible solutions. The freeze timer is factory set and no adjustment is required.

S4 Dip Switch Setting		**Time (minutes)**
No. 9	**No. 10**	
OFF	OFF	60
OFF	ON	50
ON	OFF	70
ON	ON	75

h) Float Switch Selector (S5 dip switch 1): "G" Control Board

NOTICE
Do not adjust. This must be left in the factory default position or the icemaker will not operate correctly.

i) Refill Counter (S5 dip switch 2 through 5): "G" Control Board

NOTICE
Do not adjust. These must be left in the factory default position or the icemaker will not operate correctly.

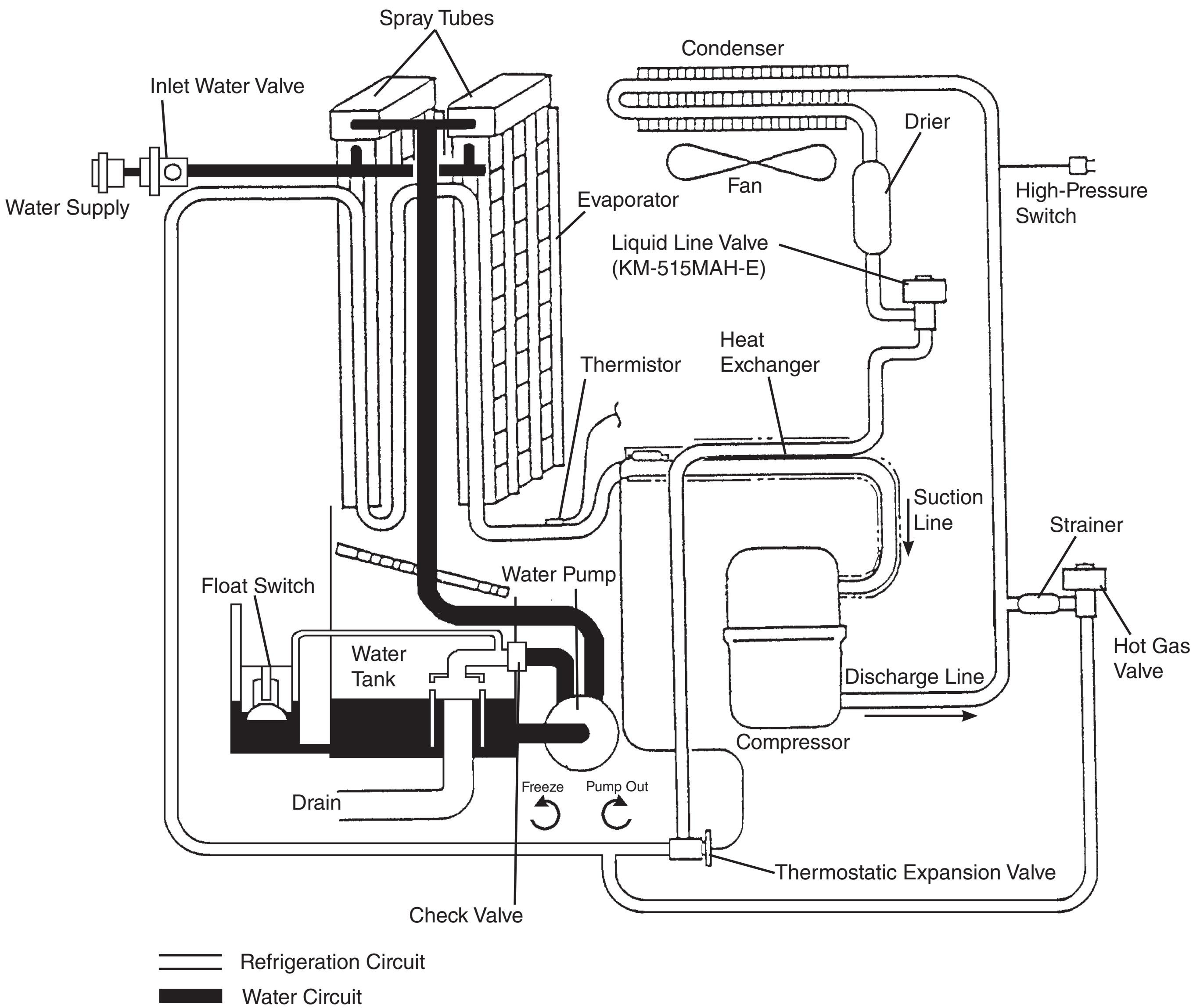
D. Control Switch

The control switch has three positions: "OFF" for power off, "ICE" for icemaking, and "WASH" to activate the water pump when cleaning and sanitizing.

III. Technical Information

A. Water Circuit and Refrigeration Circuit

1. KM-320MAH-E, KM-515MAH-E, and KM-650MAH-E

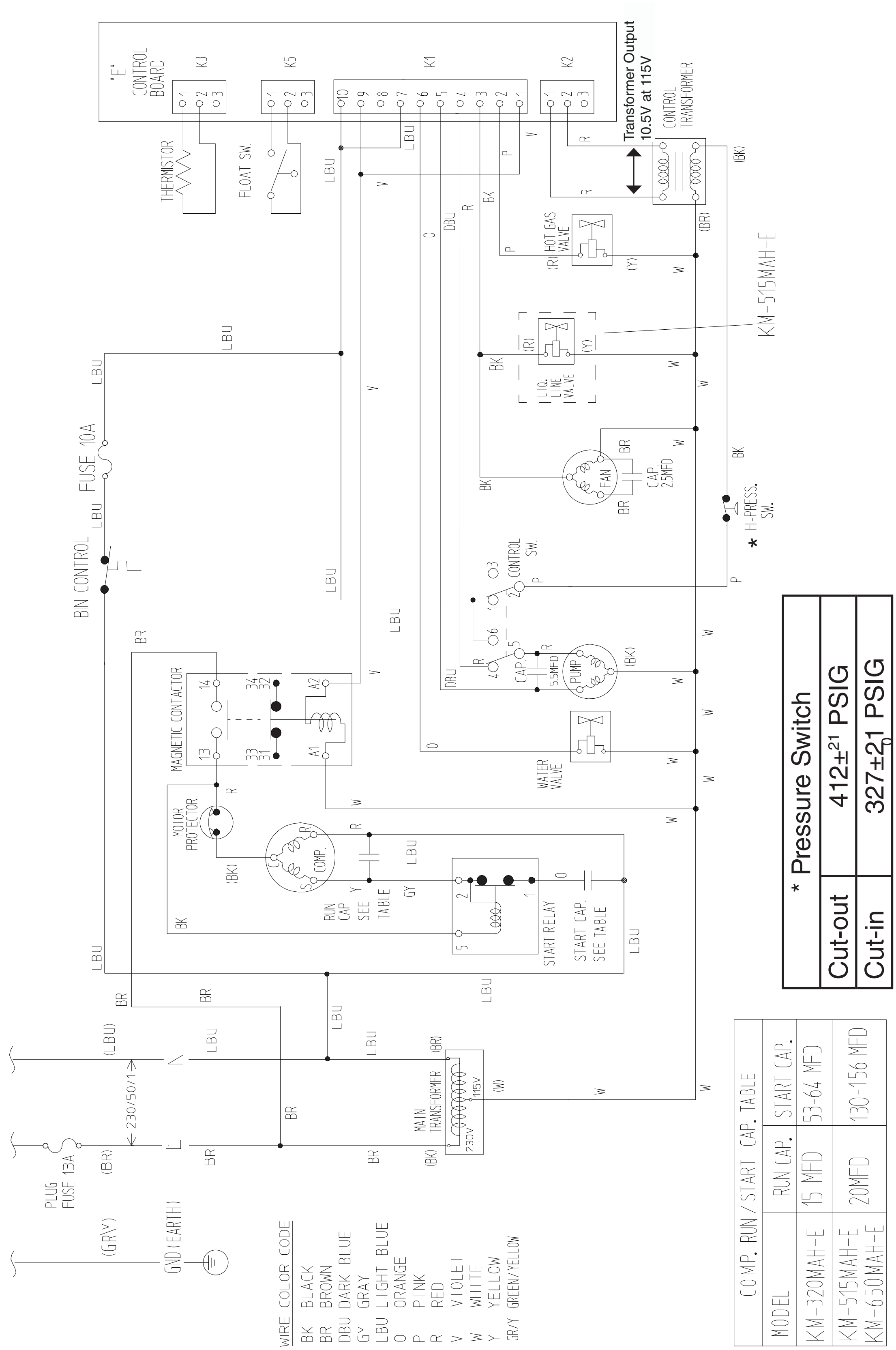


B. Wiring Diagram

1. Thermostatic Bin Control

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier

KM-515MAH-E Auxiliary Code U-1 and Earlier



* Pressure Switch	
Cut-out	412^{+21}_{-0} PSIG
Cut-in	327±21 PSIG

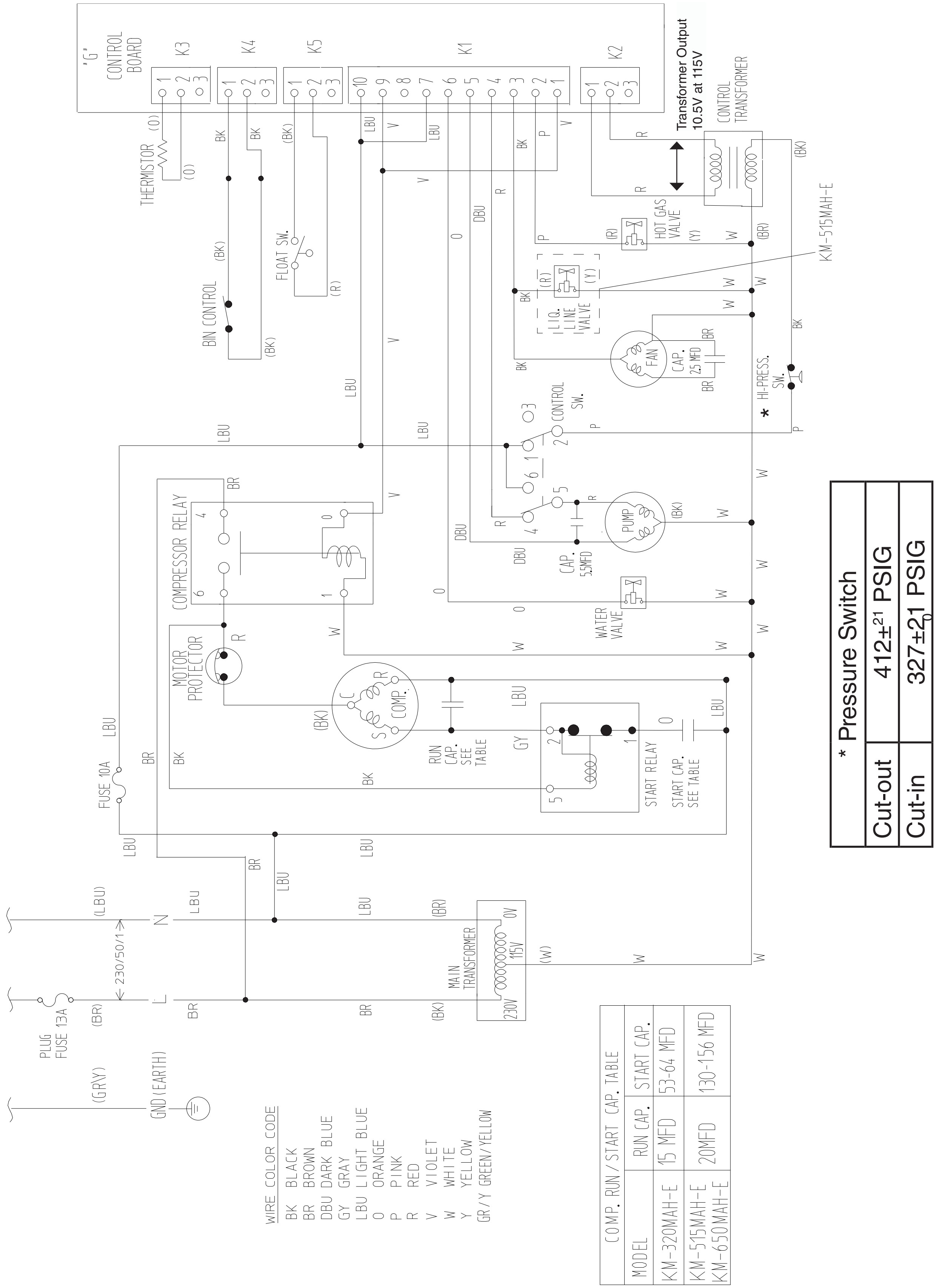
COMP. RUN / START CAP. TABLE

MODEL	RUN CAP.	START CAP.
KM-320MAH-E	15 MFD	53-64 MFD
KM-515MAH-E KM-650MAH-E	20MFD	130-156 MFD

2. Mechanical Bin Control

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later

KM-515MAH-E Auxiliary Code U-2 and Later



* Pressure Switch	
Cut-out	$412\pm^{21}_{0}$ PSIG
Cut-in	327±21 PSIG

COMP. RUN / START CAP. TABLE

MODEL	RUN CAP.	START CAP.
KM-320MAH-E	15 MFD	53-64 MFD
KM-515MAH-E KM-650MAH-E	20MFD	130-156 MFD

WIRE COLOR CODE

- BK BLACK
- BR BROWN
- DBU DARK BLUE
- GY GRAY
- LBU LIGHT BLUE
- O ORANGE
- P PINK
- R RED
- V VIOLET
- W WHITE
- Y YELLOW
- GR/Y GREEN/YELLOW

C. Performance Data

1. KM-320MAH-E

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (ºF/ºC)	WATER TEMP. (ºF/ºC)					
		50/10		70/21		90/32	
	70/21	**293**	133	275	125	255	116
	80/27	279	127	252	114	234	106
	90/32	275	125	**232**	105	213	97
lbs./day kg./day	100/38	273	124	228	103	196	89
APPROXIMATE ELECTRIC CONSUMPTION	70/21	**650**		668		673	
	80/27	663		691		686	
	90/32	668		**710**		710	
watts	100/38	663		710		710	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	**117**	0.44	98	0.37	89	0.34
	80/27	103	0.39	73	0.28	73	0.28
	90/32	98	0.37	**52**	0.19	47	0.18
gal./day m^3/day	100/38	76	0.29	51	0.19	43	0.16
FREEZING CYCLE TIME	70/21	**34**		37		39	
	80/27	36		42		42	
	90/32	37		**47**		47	
min.	100/38	37		47		48	
HARVEST CYCLE TIME	70/21	**5.8**		4.9		4.5	
	80/27	5.1		3.8		3.8	
	90/32	4.9		**2.8**		2.7	
min.	100/38	3.9		2.8		2.5	
HEAD PRESSURE	70/21	**210**	14.8	235	16.5	253	17.8
	80/27	229	16.1	268	18.8	276	19.4
	90/32	235	16.5	**295**	20.7	308	21.7
PSIG kg/cm^2G	100/38	233	16.4	298	21.0	320	22.5
SUCTION PRESSURE	70/21	**56**	3.9	57	4.0	58	4.1
	80/27	57	4.0	59	4.1	60	4.2
	90/32	57	4.0	**60**	4.2	61	4.3
PSIG kg/cm^2G	100/38	57	4.0	60	4.2	62	4.4

TOTAL HEAT OF REJECTION FROM CONDENSER 5,400 BTU/h [AT 90ºF (32ºC) / WT 70ºF (21ºC)]

Note:
1. Pressure data is recorded at 5 minutes into freezing cycle. The data not in **bold** should be used for reference only.
2. We reserve the right to make changes in specifications and design without prior notice.

2. KM-515MAH-E

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (ºF/ºC)	WATER TEMP. (ºF/ºC) 50/10		70/21		90/32	
	70/21	**513**	233	482	219	441	200
	80/27	490	222	442	200	401	182
	90/32	482	219	**408**	185	366	166
lbs./day kg./day	100/38	474	215	398	181	328	149
APPROXIMATE ELECTRIC CONSUMPTION	70/21	**1080**		1115		1150	
	80/27	1107		1161		1189	
	90/32	1115		**1200**		1231	
watts	100/38	1118		1207		1260	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	**159**	0.60	144	0.55	131	0.50
	80/27	148	0.56	125	0.47	115	0.44
	90/32	144	0.55	**108**	0.41	97	0.37
gal./day m^3/day	100/38	125	0.47	106	0.40	87	0.33
FREEZING CYCLE TIME	70/21	**26**		28		32	
	80/27	28		31		35	
	90/32	28		**33**		37	
min.	100/38	29		34		40	
HARVEST CYCLE TIME	70/21	**3.4**		3.2		3.2	
	80/27	3.3		3.0		3.1	
	90/32	3.2		**2.9**		2.9	
min.	100/38	3.1		2.9		2.9	
HEAD PRESSURE	70/21	**245**	17.2	267	18.8	294	20.6
	80/27	262	18.4	296	20.8	321	22.5
	90/32	267	18.8	**320**	22.5	346	24.3
PSIG kg/cm^2G	100/38	271	19.1	326	22.9	370	26.0
SUCTION PRESSURE	70/21	**50**	3.5	54	3.8	57	4.0
	80/27	53	3.8	60	4.2	61	4.3
	90/32	54	3.8	**65**	4.6	67	4.7
PSIG kg/cm^2G	100/38	54	3.8	65	4.6	69	4.9

TOTAL HEAT OF REJECTION FROM CONDENSER 10,400 BTU/h [AT 90ºF (32ºC) / WT 70ºF (21ºC)]

Note:
1. Pressure data is recorded at 5 minutes into freezing cycle. The data not in **bold** should be used for reference only.
2. We reserve the right to make changes in specifications and design without prior notice.

3. KM-650MAH-E

APPROXIMATE ICE PRODUCTION PER 24 HR.	AMBIENT TEMP. (ºF/ºC)	WATER TEMP. (ºF/ºC) 50/10		70/21		90/32	
	70/21	**653**	296	610	277	558	253
	80/27	620	281	554	251	506	229
	90/32	610	277	**507**	230	456	207
lbs./day kg./day	100/38	602	273	495	225	409	186
APPROXIMATE ELECTRIC CONSUMPTION	70/21	**1090**		1122		1164	
	80/27	1115		1165		1205	
	90/32	1122		**1200**		1242	
watts	100/38	1130		1210		1280	
APPROXIMATE WATER CONSUMPTION PER 24 HR.	70/21	**162**	0.61	142	0.54	130	0.49
	80/27	147	0.56	116	0.44	113	0.43
	90/32	142	0.54	**94**	0.36	87	0.33
gal./day m^3/day	100/38	119	0.45	92	0.35	81	0.31
FREEZING CYCLE TIME	70/21	**29**		32		35	
	80/27	31		34		38	
	90/32	32		**37**		40	
min.	100/38	32		38		43	
HARVEST CYCLE TIME	70/21	**3.9**		3.6		3.5	
	80/27	3.7		3.2		3.3	
	90/32	3.6		**2.9**		2.9	
min.	100/38	3.3		2.9		2.9	
HEAD PRESSURE	70/21	**236**	16.6	259	18.2	286	20.1
	80/27	254	17.8	290	20.4	314	22.1
	90/32	259	18.2	**315**	22.1	341	24.0
PSIG kg/cm^2G	100/38	263	18.5	321	22.6	365	25.7
SUCTION PRESSURE	70/21	**53**	3.7	55	3.9	58	4.1
	80/27	55	3.8	58	4.1	60	4.2
	90/32	55	3.9	**60**	4.2	63	4.4
PSIG kg/cm^2G	100/38	56	3.9	61	4.3	65	4.6

TOTAL HEAT OF REJECTION FROM CONDENSER 9,800 BTU/h [AT 90ºF (32ºC) / WT 70ºF (21ºC)]

Note:
1. Pressure data is recorded at 5 minutes into freezing cycle. The data not in **bold** should be used for reference only.
2. We reserve the right to make changes in specifications and design without prior notice.

IV. Service Diagnosis

⚠ WARNING

- This icemaker should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
- Risk of electric shock. Use extreme caution and exercise safe electrical practices.
- Moving parts (e.g., fan blade) can crush and cut. Keep hands clear.
- **CHOKING HAZARD:** Ensure all components, fasteners, and thumbscrews are securely in place after the icemaker is serviced. Make sure that none have fallen into the dispenser icemaker/storage bin.
- Make sure all food zones in the icemaker and dispenser icemaker/storage bin are clean after service. For cleaning procedures, see "VI. Cleaning and Maintenance."

A. Diagnostic Procedure

The diagnostic procedure is basically a sequence check which can be used at icemaker startup or for system diagnosis. This procedure allows you to diagnose electrical system and component failures. Before conducting the diagnostic procedure, check for correct installation, proper voltage per icemaker nameplate, and adequate water supply. Check CB using the steps in "IV.B. Control Board Check." Check the dip switch settings to assure that S4 dip switch 3, 4, 7, 8, 9, 10 and S5 dip switch 1 through 5 ("G" CB) are in the factory default position. S4 dip switch 1, 2, 5, 6 are cleaning adjustments and the settings are flexible. For factory default settings, see "II.C.3.a) Default Dip Switch Settings." As you go through the procedure, check to assure the components energize and de-energize correctly. If not, those components and controls are suspect.

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket. Clear any ice from TBC or MBC.

2) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position. A 5-second delay occurs. The red "POWER OK" LED on CB comes on. On "G" CB, the green "BC CLOSED" LED also comes on. If the yellow "BC OPEN" LED is on (indicating a full bin), check MBC. See "IV.C.2.a) Mechanical Bin Control Check." If CB LEDs do not turn on, see "IV.F.1. No Ice Production."

3) **1-Minute Fill Cycle – LED 4 is on.** WV energizes. After 1 minute, CB checks for a closed F/S. If F/S is closed, the harvest cycle begins. If closed, continue to step 4. If F/S is open, WV remains energized through additional 1-minute fill cycles until water enters the water tank and F/S closes (low water safety protection during initial start up and at the end of each harvest). **Diagnosis:** Confirm that water enters the water tank. If not, check that the water supply shut-off valve is open and screens or external filters are clear. Check supply voltage at WV solenoid. If no voltage is present, see "IV.B. Control Board Check." If voltage is present, check solenoid continuity. If the water tank fills, but the icemaker fails to start harvest, check for open F/S. See "IV.D. 1. Float Switch Check." If F/S checks ok, replace CB.

4) **Initial Harvest Cycle – LEDs 1, 4, and 2 are on.** WV remains energized, Comp and HGV energize. CB monitors the warming of the evaporator via the thermistor located on the suction line. When the thermistor reaches 48°F (9°C), CB reads 3.9 kΩ from the thermistor and turns harvest termination over to the harvest timer (S4 dip switch 1 & 2). The harvest timer has settings of 60, 90, 120, and 180 seconds. When the harvest timer terminates, the harvest cycle is complete. CB checks the position of F/S and proceeds to the next cycle if it is closed or calls for a 1-minute fill cycle if it is open. The minimum total time allowed by CB for a complete harvest cycle is 2 minutes.

The pump-out timer (S4 dip switch 3 & 4) acts in place of the harvest timer during cycles with a pump-out (S4 dip switch 5 & 6). WV is energized during harvest for a maximum of 6 minutes. ***NOTICE!*** **Do not adjust S4 dip switch 7 out of the factory default position on this model. This dip switch must be left in the factory default position or this icemaker will not operate correctly.** For details, see "II.C.3.e) Bin Control Selector/Harvest Pump Timer (S4 Dip Switch 7)."

Diagnosis: Check if Comp is running, HGV and WV still energized. Average harvest cycle at factory setting is 2 to 3 minutes. How long does initial harvest last? 1.5 minutes after initial harvest begins, touch Comp discharge line. Is it hot? If not, check refrigerant pressures and Comp operation. If it is hot, touch the inlet line to the evaporator. Is it hot? If it is hot and the freeze cycle is not starting, check the harvest timer adjustment (S4 dip switch 1 & 2), the thermistor for open circuit, the discharge line temperature, Comp efficiency, and if HGV is fully open. For a thermistor check, see "IV.E. Thermistor Check." If 1-minute fill cycle starts after harvest, check that F/S is clean and operating properly, see "IV.D. Float Switch Check and Cleaning." Make sure PM does not come on last 50 seconds of harvest on icemakers with "G" CB. For details, see "II.C.3.e) Bin Control Selector/Harvest Pump Timer (S4 Dip Switch 7)."

5) **Freeze Cycle – LED 1 is on.** Comp remains energized, PM, FM, and LLV (KM-515MAH-E) energize. WV and HGV de-energize. For the first 5 minutes, CB will not terminate the freeze cycle. At the end of 5 minutes, F/S assumes control of the freeze cycle. As ice builds on the evaporator, the water level in the water tank lowers. Freeze continues until F/S opens, provided the 5-minute minimum freeze timer has terminated.
Diagnosis: During the first 5 minutes of freeze, confirm that the evaporator temperature drops. If the evaporator is not cold, check to see if HGV is still open or if TXV is not opening properly, if WV is continuing to fill the reservoir, if there are improper icemaker pressures, or an inoperative Comp. After 5 minutes in freeze, disconnect black F/S connector from CB BLACK K5 connector. The icemaker should switch out of the freeze cycle ("G" CB - 15 second delay after F/S opens before terminating the freeze cycle). If the icemaker switches out of freeze with F/S removed, but would previously not switch out of freeze with F/S connected (long freeze - 3 beep alarm), F/S may be sticking.
To check and clean F/S, see "IV.D. Float Switch Check and Cleaning." If the icemaker remains in freeze (longer than 15 seconds on "G" CB) after disconnecting the black F/S connector, replace CB.
Note: Normal freeze cycle will last 20 to 40 minutes depending on model and conditions. Cycle times and pressures should follow performance data provided in this manual. See "III.C. Performance Data."

6) **Pump-Out Cycle – (10/20 second pump-out) – LEDs 1, 3, and 2 are on.** LED 4 is on when S4 dip switch 3 & 4 are set to 3 off and 4 on (KM-320MAH-E). Comp remains energized, HGV energizes. WV energizes if S4 dip switch 3 off and 4 on. LLV (KM-515MAH-E) and FM de-energize. PM stops for 2 seconds, then reverses for 10/20 seconds depending on pump-out timer S4 dip switch 3 & 4 setting. When the pump-out timer expires, the pump-out is complete. The pump-out frequency control is factory set for every 10th cycle on KM-320MAH-E and every cycle for KM-515MAH-E and KM-650MAH-E. Generally no adjustment is required. However, the pump-out frequency can be adjusted. The pump-out frequency control (S4 dip switch 5 & 6) can be set to have a pump-out occur every cycle, or every 2, 5, or 10 cycles. For details, see "II.C.3.d) Pump-Out Frequency Control (S4 dip switch 5 & 6)."

Timing of the first pump-out is dependent on CB. "E" CB first pump-out is after the first freeze cycle. "G" CB first pump-out is determined by S4 dip switch 5 & 6. See the table below.

"E" & "G" Control Board Settings			1st Pump-Out	
S4 Dip Switch Setting		Pump-Out Frequency	"E" Control Board	"G" Control Board
No. 5	No. 6			
OFF	OFF	Every cycle	After 1st freeze cycle	After 2nd freeze cycle
ON	OFF	Every 2 cycles		After 3rd freeze cycle
OFF	ON	Every 5 cycles		After 6th freeze cycle
ON	ON	Every 10 cycles		After 11th freeze cycle

Diagnosis: Check PM circuit and capacitor, check #5 pin (DBU wire) on CB K1 ten-pin connector for voltage. If water does not pump out, check and clean the check valve assembly and tubing.

7) **Normal Harvest Cycle –** same as the initial harvest cycle – See "IV.A.4) Initial Harvest Cycle."

8) **Shutdown**

a) Thermostatic Bin Control:

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier

KM-515MAH-E Auxiliary Code U-1 and Earlier

When the icemaker is running hold ice in contact with the thermostatic bulb, TBC switch opens within 10 seconds, shutting down the icemaker. TBC is factory set, and generally no adjustment is required. However, adjustment may be needed in some conditions, particularly at higher altitude locations. ***NOTICE!*** **Do not adjust S4 dip switch 7 out of the factory default position on this model. This dip switch must be left in the factory default position or this icemaker will not operate correctly. Diagnosis:** See "IV.C.1. Thermostatic Bin Control Check: Auxiliary Code U-0 and Earlier."

b) Mechanical Bin Control:

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later

KM-515MAH-E Auxiliary Code U-2 and Later

See "IV.C.2.a) Mechanical Bin Control Check."

Legend: **CB**–control board; **Comp**–compressor; **FM**–fan motor; **F/S**–float switch; **HGV**–hot gas valve; **LLV**–liquid line valve (KM-515MAH-E); **MBC**–mechanical bin control; **PM**–pump motor; **TBC**–thermostatic bin control; **TXV**–thermostatic expansion valve; **WV**–inlet water valve

B. Control Board Check

Before replacing CB that does not show a visible defect and that you suspect is bad, always conduct the following check procedure. This procedure will help you verify your diagnosis.

Alarm Reset: If CB is in alarm (beeping), press the "ALARM RESET" button on CB while CB is beeping. **WARNING! Risk of electric shock. Care should be taken not to touch live terminals.** Once reset, the icemaker starts at the 1-minute fill cycle. For audible alarm information, see "II.C.2. LED Lights and Audible Alarm Safeties."

1) Check the dip switch settings to assure that S4 dip switch 3, 4, 7, 8, 9, 10 and S5 dip switch 1 through 5 ("G" CB) are in the factory default position. S4 dip switch 1, 2, 5, 6 are cleaning adjustments and the settings are flexible. For factory default settings, see "II.C.3.a) Default Dip Switch Settings."

2) Move the control switch to the "ICE" position. If the red "POWER OK" LED is on, control voltage is good, continue to step 3. If the "POWER OK" LED is off, check CT secondary circuit. CT output is 10.5VAC at 115VAC primary input. If the secondary circuit has proper voltage and the red LED is off, replace CB.

   If the secondary circuit does not have proper voltage, check CT primary circuit. Check for 115VAC at CB K1 connector pin #10 (BR wire) to a neutral (W wire) for 115VAC. (Always choose a neutral (W wire) to establish a good neutral connection when checking voltages.) For additional checks, see "IV.F.1. No Ice Production."

3) The "OUTPUT TEST" button provides a relay sequence test. Make sure the control switch is in the "ICE" position, then press the "OUTPUT TEST" button. For the correct lighting sequence, see the table below. Note that the order of the LEDs from the outer edge of the control board is 1, 4, 3, 2. Components (e.g., compressor) cycle during the test.

Control Board	Correct LED Lighting Sequence
"E"	2, 3, 4, 1
"G"	1, 4, 3, 2

   Following the test, the icemaker begins operation at the 1-minute fill cycle. If the LEDs do not light as described above, replace CB.

4) To verify voltage output from CB to the components, slide the CB K1 connector out far enough to allow multimeter lead contact. With the icemaker in the cycle to be tested, check output voltage from the corresponding pin on CB K1 connector to a neutral (W wire). If output voltage is not found and the appropriate LED is on, replace CB.

Legend: **CB**–control board; **CT**–control transformer

C. Bin Control Check

1. Thermostatic Bin Control Check

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-0 and Earlier

KM-515MAH-E Auxiliary Code U-1 and Earlier

TBC switch is a temperature controlled switch used to control the level of ice in the bin. It is in line with the power supply to the control switch. TBC shuts down the icemaker within 10 seconds when ice contacts the thermostatic bulb, regardless of the cycle at activation. TBC is factory set, and generally no adjustment is required. However, adjustment may be needed in some conditions, particularly at higher altitude locations.
To check TBC, follow the steps below.

NOTICE
When the ambient temperature is below 45°F (7°C), the thermostatic bin control switch opens and shuts down the icemaker even if the ice storage bin is empty. When the thermostat is set in the prohibited range, the icemaker operates continuously even if the ice storage bin is filled with ice. Setting in the prohibited range may result in severe damage to the icemaker.

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.
2) Remove the control box cover.
3) Disconnect TBC wires from TBC switch.
4) Clear any ice away from TBC bulb, then hold your hand around TBC bulb to warm it up.
5) Check for continuity across TBC switch. If closed, continue to step 6. If open, adjust or replace TBC.
6) With the multimeter test leads still in place, hold ice on TBC bulb to lower the temperature. Within 10 seconds, TBC switch should open. If it remains closed, adjust or replace TBC.

Legend: **TBC**–thermostatic bin control

2. Mechanical Bin Control Check and Cleaning

KM-320MAH-E and KM-650MAH-E Auxiliary Code U-1 and Later

KM-515MAH-E Auxiliary Code U-2 and Later

a) Mechanical Bin Control Check

This icemaker uses a MBC with a lever-actuated proximity switch to control the ice level in the storage bin. No adjustment is required. MBC connects to CB K4 (red) connector. When the actuator paddle is not engaged (MBC closed; CB green "BC CLOSED" LED is on), icemaker produces ice. When the actuator paddle is engaged (MBC open; CB yellow "BC OPEN" LED is on), icemaker shuts down as outlined in the chart below.
To check the mechanical bin control switch, follow the steps below.

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.

2) Remove the control box cover, then clear any ice away from MBC.

3) Check MBC wire harness (white) connection. See Fig. 1.

4) Disconnect MBC connector from CB K4 (red) connector.

5) Check for continuity across the wires of MBC connector. When the actuator paddle is not engaged, MBC switch is closed. If open, check that the white harness (white) connector properly connected and that the actuator paddle is not sticking. Clean if necessary. See "IV.C.2.b) Mechanical Bin Control Cleaning." If MBC switch still reads open, replace MBC.

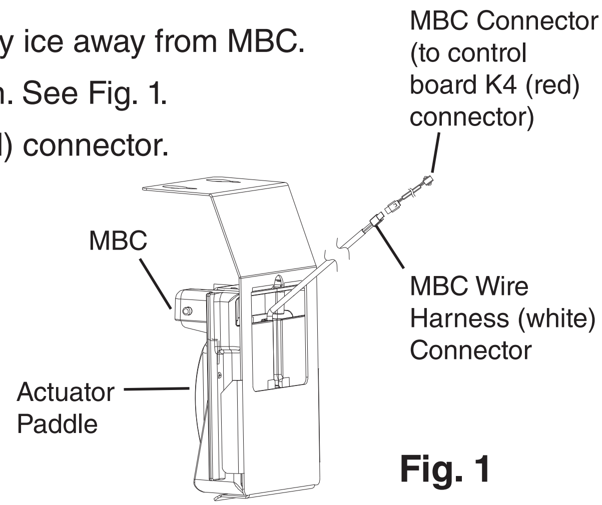


Fig. 1

6) Press and hold the actuator paddle; check for continuity across the wires of MBC connector. When the actuator paddle is engaged, MBC switch is open. If closed, check that the actuator paddle is not restricted. Clean if necessary. See "IV.C.2.b) Mechanical Bin Control Cleaning." If MBC switch still reads closed, replace MBC.

7) Reconnect MBC connector to CB K4 (red) connector.

8) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position to start the automatic icemaking process.

9) Check that the green "BC CLOSED" LED on the control board is on.

10) Allow the icemaker to cycle on. Press and hold the actuator paddle. The yellow "BC OPEN" LED should be on and the icemaker should shut down according to the chart below. If it does not, replace CB.

Cycle at Mechanical Bin Control Activation	Shutdown
Fill Cycle	15 seconds after activation.
Harvest Cycle	At the end of the harvest cycle, or up to 15 seconds into the freeze cycle if activated at the end of the harvest cycle.
Freeze Cycle	15 seconds after activation if activated at least 15 seconds before the 5-minute short cycle protection timer terminates. Otherwise, at the end of the next harvest cycle.

Legend: **MBC**–mechanical bin control; **CB**–control board;

b) Mechanical Bin Control Cleaning

Scale may build up on MBC. Scale can cause the actuator paddle and magnet to stick. In this case, MBC should be cleaned.

⚠ WARNING
CHOKING HAZARD: Ensure all components, fasteners, and thumbscrews are securely in place after the icemaker is serviced. Make sure that none have fallen into the storage bin.

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.
2) Remove the control box cover and base cover.
3) Clear any ice away from MBC.
4) Disconnect MBC connector from CB K4 (red) connector, then remove MBC from the icemaker.
5) Remove the actuator paddle from the switch mount. See Fig. 2.
6) Wipe down MBC with a mixture of 1 part of Hoshizaki "Scale Away" and 25 parts of warm water. Rinse the parts thoroughly with clean water.
7) Reassemble MBC and replace it in its correct position.
   Note: If the magnet was removed for cleaning, be sure to replace it in its correct position.
8) Reconnect MBC connector to CB K4 (red) connector.
9) Replace the control box cover and base cover in their correct positions.

11) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position to start the automatic icemaking process.
12) Replace the front panel in its correct position.

Legend: **MBC**–mechanical bin control

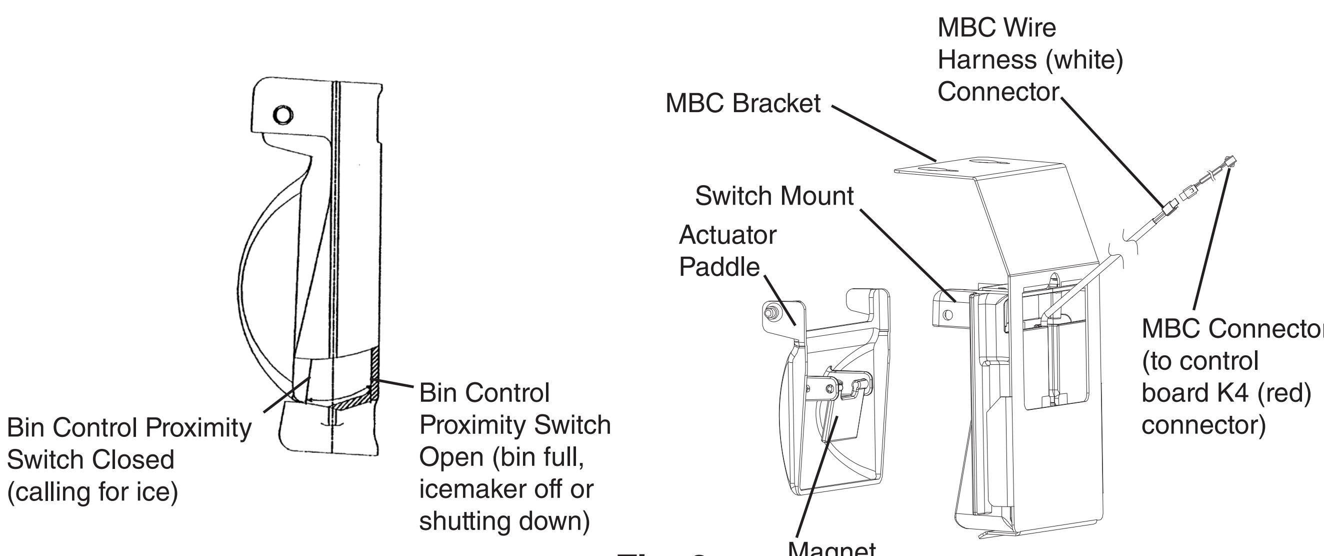


Fig. 2

D. Float Switch Check and Cleaning

F/S is used to determine that there is sufficient water in the water tank after the 1-minute fill cycle and after each harvest cycle. F/S is also used to determine that the appropriate volume of water has been converted into ice before switching out of the freeze cycle. No adjustment is required.

1. Float Switch Check

To check F/S, follow the steps below.

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.

2) Remove the base cover, then disconnect one end of the pump tubing to drain the water tank. See Fig. 3. After the water tank has drained, reconnect the pump tubing.

3) Remove the control box cover.

4) Disconnect the black F/S connector from CB K5 (black) connector.

5) Check for continuity across F/S leads. With the water tank empty, F/S should be open. If open, continue to step 7. If closed, follow the steps in "IV.D.2. Float Switch Cleaning." After cleaning F/S, check it again. Replace if necessary.

6) Reconnect the black F/S connector, then replace the control box cover in its correct position.

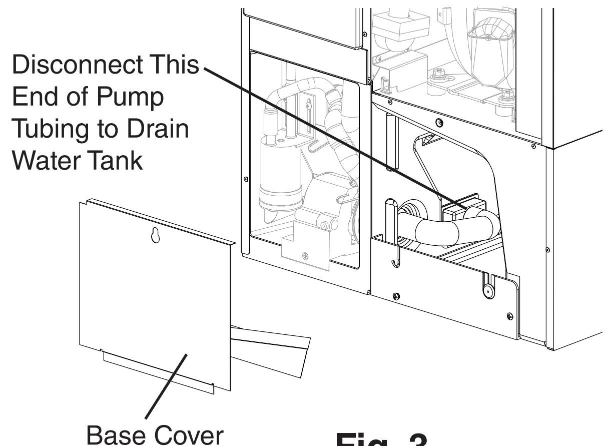


Fig. 3

7) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position. Replace the front panel in its correct position. After 1 minute, the 1-minute fill cycle should end and the initial harvest cycle should begin. If the initial harvest cycle begins, F/S is good and the check is complete. If the initial harvest cycle does not begin, continue to step 9.

8) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.

9) Remove the control box cover.

10) Disconnect the black F/S connector from CB K5 (BLACK) connector.

11) Check for continuity across F/S leads. With the water tank full, F/S should be closed. If F/S is closed and the icemaker will not switch from the 1-minute fill cycle to the initial harvest cycle, replace CB.

    If F/S is open, confirm that the water tank is full. If the water tank is not full, check the water supply, water filters, and inlet water valve. If the water tank is full, follow the steps in "IV.D.2. Float Switch Cleaning." After cleaning F/S, check it again. Replace if necessary.

2. Float Switch Cleaning

Depending on local water conditions, scale may build up on F/S. Scale on the switch can cause the float to stick. In this case, F/S should be cleaned.

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.
2) Remove the base cover, then disconnect one end of the pump tubing to drain the water tank. See Fig. 3. After the water tank has drained, reconnect the pump tubing.
3) Disconnect the vent tube and the flush tube from the top of F/S, then remove F/S assembly and remove the rubber boot from the bottom of F/S assembly. See Fig. 4.
4) Remove the retainer rod from the bottom of F/S housing, then remove the float. Be careful not to bend the retainer rod excessively when removing it.
5) Wipe down F/S housing, shaft, float, and retainer rod with a mixture of 1 part Hoshizaki "Scale Away" and 25 parts warm water. Clean the inside of the rubber boot and hose with cleaning solution. Rinse the parts thoroughly with clean water.
6) Reassemble F/S assembly and replace it and the rubber boot in their correct positions. Reconnect the vent tube and the flush tube.
7) Replace the base cover in its correct position.
8) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position. Replace the front panel in its correct position.

Legend: **CB**–control board; **F/S**–float switch

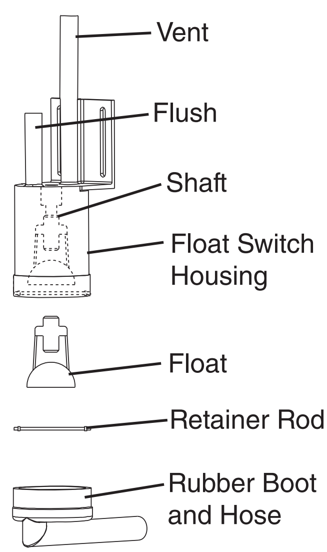


Fig. 4

E. Thermistor Check

To check thermistor resistance, follow the steps below.

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.
2) Remove the control box cover.
3) Remove the thermistor.
4) Immerse the thermistor sensor portion in a glass containing ice and water for 2 or 3 minutes.
5) Remove the white thermistor connector from CB K3 (white) connector and check the resistance between thermistor leads. Normal reading is within 4.7 to 6.2 kΩ. If outside the normal range, replace the thermistor. See "V.B. Important Notes for Component Replacement." If within the normal range, continue to the next step.
6) Replace the thermistor in its correct position. See "V.B. Important Notes for Component Replacement."
7) Reconnect the white thermistor connector to CB K3 (white) connector.
8) Replace the control box cover in its correct position.
9) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position. Replace the front panel in its correct position.
10) Once the harvest cycle starts (Comp energizes), begin timing the harvest cycle.
11) The harvest timer and harvest cycle should terminate within 2 to 5 minutes. If the harvest cycle does not terminate within 2 to 5 minutes, replace CB.

Legend: **CB**–control board; **Comp**–compressor

F. Diagnostic Charts

1. No Ice Production

No Ice Production - Possible Cause	
1. Power Supply	a) Off, blown fuse, or tripped breaker.
	b) Not within specifications.
2. Fuse (Power Cord)	a) Blown.
3. Main Transformer (230VAC/115VAC)	a) Coil winding open or shorted.
4. Fuse (Control Box)	a) Blown.
5. Thermostatic Bin Control (KM-320MAH-E and KM-650MAH-E Aux. Code U-0 and Earlier; KM-515MAH-E Aux. Code U-1 and Earlier) See "IV.C. Bin Control Check"	a) Tripped with bin filled with ice.
	b) Ambient temperature too cool.
	c) Set too warm.
	d) Bulb out of position.
	e) Open contacts, defective.
6. Control Switch	a) In "OFF" or "WASH" position.
	b) Bad contacts.
7. High-Pressure Switch	a) Dirty condenser.
	b) Fan motor not operating.
	c) Refrigerant overcharged.
	d) Bad contacts.
	e) Refrigerant lines or components plugged.
8. Control Transformer (115VAC/10.5VAC)	a) Coil winding open or shorted.
9. Control Board See "IV.B. Control Board Check"	a) In alarm.
	b) Yellow "BC OPEN" LED on (bin full).
	c) Defective.
10. Mechanical Bin Control (KM-320MAH-E and KM-650MAH-E Aux. Code U-1 and Later; KM-515MAH-E Aux. Code U-2 and Later) See "IV.C. Bin Control Check"	a) Tripped with bin filled with ice.
	b) Actuator does not move freely.
	c) Defective.
11. Water Supply	a) Water supply off or improper water pressure.
	b) External water filters clogged.
12. Inlet Water Valve	a) Screen or orifice clogged.
	b) Coil winding open.
	c) Water valve open in freeze cycle.
13. Float Switch See "IV.D. Float Switch Check and Cleaning"	a) Float does not move freely.
	b) Defective.

No Ice Production - Possible Cause	
14. Compressor	a) Compressor relay/magnetic contactor contacts bad or coil winding open.
	b) Start capacitor or run capacitor defective.
	c) Internal protector open.
	d) Start relay contacts bad or coil winding open.
	e) Compressor defective.
15. Hot Gas Valve	a) Closed in harvest cycle.
	b) Open in freeze cycle.
16. Thermistor See "IV.E. Thermistor Check"	a) Loose, disconnected, or defective.
17. Pump Motor	a) Motor winding open.
	b) Bearing worn out or locked rotor.
	c) Defective capacitor.
	d) Mechanical seal worn out.
18. Thermostatic Expansion Valve	a) Bulb loose.
	b) Operating erratically.
19. Liquid Line Valve (KM-515MAH-E)	a) Closed in freeze cycle.
	b) Open in harvest cycle.
20. Fan Motor	a) Motor winding open.
	b) Bearing worn out or locked rotor.
	c) Defective capacitor.
21. Water System	a) Water leaks causing short freeze time.

2. Freeze-Up

Defrost and clean the icemaker prior to diagnosing freeze-up. See "VI.A. Cleaning and Sanitizing Instructions." Fill out a freeze-up checklist. The freeze-up checklist can be found in the Hoshizaki America Technician's Pocket Guide or contact your local distributor for a copy of the freeze-up checklist.

Freeze-Up - Possible Cause	
Harvest Cycle	
1. Evaporator	a) Scaled up.
	b) Damaged.
2. Cube Guides	a) Out of position.
	b) Damaged.
3. Spray Tubes and/or Spray Guides	a) Dirty.
	b) Out of position.
4. Water Supply	a) Low water pressure.
	b) External water filters clogged.
	c) Insufficient water line size. Minimum 1/4" Nominal ID (6 mm Nominal OD in the EU) water tubing or equivalent.
5. Inlet Water Valve	a) Screen or orifice clogged.
	b) Defective.

Freeze-Up - Possible Cause	
6. Float Switch See "IV.D. Float Switch Check and Cleaning"	a) Dirty, sticking.
	b) Defective.
7. Refrigerant Charge	a) Low.
8. Control Board See "II.C.3. Controls and Adjustments" and "IV.B. Control Board Check"	a) Harvest timer (S4 dip switch 1 & 2) set too short.
	b) Harvest pump timer (S4 dip switch 7) not in factory default position.
	c) Defective.
9. Bin Control See "IV.C. Bin Control Check"	a) Actuator does not move freely.
10. Thermistor See "IV.E. Thermistor Check"	a) Loose, disconnected, or defective.
11. Thermostatic Expansion Valve	a) Defective.
12. Hot Gas Valve	a) Closed or restricted.
13. Liquid Line Valve (KM-515MAH-E)	a) Open.
Freeze Cycle	
1. Evaporator	a) Scaled up.
	b) Damaged.
2. Spray Tubes and/or Spray Guides	a) Dirty.
	b) Out of position.
3. Refrigerant Charge	a) Low.
4. Control Board See "IV.B. Control Board Check"	a) Freeze timer (S4 dip switch 9 & 10) set incorrectly.
	b) Defective.
5. Inlet Water Valve	a) Leaking by.
6. Float Switch See "IV.D. Float Switch Check and Cleaning"	a) Float does not move freely.
	b) Defective.
7. Pump Motor	a) RPM too slow.
	b) Impeller damaged.
8. Thermostatic Expansion Valve	a) Bulb loose or defective.
9. Liquid Line Valve (KM-515MAH-E)	a) Restricted.

3. Low Ice Production

Low Ice Production - Possible Cause	
Long Harvest Cycle	
1. Evaporator	a) Scaled up.
2. Spray Tubes and/or Spray Guides	a) Dirty.
	b) Out of position.
3. Refrigerant Charge	a) Low.
4. Water Supply	a) Low water pressure.
	b) External water filters clogged.
	c) Insufficient water line size. Minimum 1/4" Nominal ID (6 mm Nominal OD in the EU) water tubing or equivalent.
	d) Too cold.
5. Control Board See "IV.B. Control Board Check"	a) Thermistor connection loose (K3).
	b) Defective.
6. Thermistor See "IV.E. Thermistor Check"	a) Loose, disconnected, or defective.
7. Hot Gas Valve	a) Erratic or closed.
8. Inlet Water Valve	a) Screen or orifice clogged.
9. Compressor	a) Inefficient or off.
10. Liquid Line Valve (KM-515MAH-E)	a) Erratic or open.
11. Thermostatic Expansion Valve	a) Defective.
Long Freeze Cycle	
1. Evaporator	a) Scaled up, dirty.
2. Float Switch See "IV.D. Float Switch Check and Cleaning"	a) Scaled up, dirty.
	b) Float sticking.
	c) Defective switch.
3. Inlet Water Valve	a) Leaking by.
4. Hot Gas Valve	a) Erratic or open.
5. Condenser	a) Clogged.
6. Control Board See "IV.B. Control Board Check"	a) Float switch connection loose (K5).
	b) Defective.
7. Refrigerant Charge	a) Low.
8. Thermostatic Expansion Valve	a) Bulb loose.
	b) Defective.
9. Compressor	a) Inefficient or off.
10. Pump Motor	a) RPM too slow.
11. Liquid Line Valve (KM-515MAH-E)	a) Erratic or restricted.

V. Replacement of Components

⚠ WARNING

- This icemaker should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
- Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket before servicing.
- **CHOKING HAZARD:** Ensure all components, fasteners, and thumbscrews are securely in place after the icemaker is serviced. Make sure that none have fallen into the storage bin.
- Make sure all food zones in the icemaker and storage bin are clean after service. For cleaning procedures, see "VI. Cleaning and Maintenance."

A. Service for Refrigerant Lines

⚠ WARNING

- Repairs requiring the refrigeration circuit to be opened must be performed by properly trained and EPA-certified service personnel.
- Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). Do not use R-404A as a mixture with pressurized air for leak testing.

NOTICE

- Always recover the refrigerant and store it in an approved container. Do not discharge the refrigerant into the atmosphere.
- Do not leave the system open for longer than 15 minutes when replacing or servicing parts. The Polyol Ester (POE) oils used in R-404A applications can absorb moisture quickly. Therefore it is important to prevent moisture from entering the system when replacing or servicing parts.
- Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made. Install the new drier with the arrow on the drier in the direction of the refrigerant flow.
- When brazing, protect the drier by using a wet cloth to prevent the drier from overheating. Do not allow the drier to exceed 250°F (121°C).

1. Refrigerant Recovery

The icemaker is provided with refrigerant access valves. Using proper refrigerant practices, recover the refrigerant. Store the refrigerant in an approved container. Do not discharge the refrigerant into the atmosphere.

2. Brazing

⚠ WARNING
• R-404A itself is not flammable at atmospheric pressure and temperatures up to 176°F (80°C).
• R-404A itself is not explosive or poisonous. However, when exposed to high temperatures (open flames), R-404A can be decomposed to form hydrofluoric acid and carbonyl fluoride both of which are hazardous.
• Do not use silver alloy or copper alloy containing arsenic.
• Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). DO NOT use R-404A as a mixture with pressurized air for leak testing.

1) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG.
   Note: Because the pipes in the evaporator case are specially coated to resist corrosion, it is important to make connections outside the evaporator case when possible. If it is necessary to braze inside the evaporator case, use sandpaper to remove the coating from the brazing connections before unbrazing the components.

NOTICE
• Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made. Install the new drier with the arrow on the drier in the direction of the refrigerant flow.
• When brazing, protect the drier by using a wet cloth to prevent the drier from overheating. Do not allow the drier to exceed 250°F (121°C).

2) Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). Do not use R-404A as a mixture with pressurized air for leak testing.

3. Evacuation and Recharge (R-404A)

1) Attach a vacuum pump to the system. Be sure to connect the charging hoses to both high and low-side refrigerant access valves.

IMPORTANT
The vacuum level and vacuum pump may be the same as those for current refrigerants. However, the rubber hose and gauge manifold to be used for evacuation and refrigerant charge should be exclusively for POE oils.

2) Turn on the vacuum pump. Open the gauge manifold valves. Never allow the oil in the vacuum pump to flow backwards.

3) Allow the vacuum pump to pull down to a 29.9" Hg vacuum. Evacuating period depends on pump capacity.

4) Close the low-side valve and high-side valve on the gauge manifold.

5) Disconnect the gauge manifold hose from the vacuum pump and attach it to a refrigerant service cylinder. Remember to loosen the connection and purge the air from the hose. See the nameplate on the icemaker for the required refrigerant charge. Hoshizaki recommends only virgin refrigerant or reclaimed refrigerant which meets ARI Standard 700 (latest edition) be used.

6) A liquid charge is required when charging an R-404A system (to prevent fractionation). Place the service cylinder on the scales; if the service cylinder is not equipped with a dip tube, invert the service cylinder, then place it on the scales. Open the high-side valve on the gauge manifold.

7) Allow the system to charge with liquid until the proper charge weight is met.

8) If necessary, add any remaining charge to the system through the low-side. ***NOTICE!*** **To prevent compressor damage, use a throttling valve or liquid dispensing device to add the remaining liquid charge through the low-side refrigerant shutoff valve with the icemaker running.**

9) Close the high and low-side gauge manifold valves, then disconnect the gauge manifold hoses.

10) Cap the refrigerant access valves to prevent a possible leak.

B. Important Notes for Component Replacement

NOTICE
When replacing a component listed below, see the notes to help ensure proper operation.

Component	Notes
Compressor	Install a new start capacitor, run capacitor, and start relay.
Thermostatic Expansion Valve	• Attach the thermostatic expansion valve bulb to the suction line in the same location as the previous bulb. • The bulb should be between the 10 and 2 o'clock positions on the tube. • Secure the bulb with the clamp and holder, then insulate it.
Hot Gas Valve Liquid Line Valve (KM-515MAH-E)	• Replace the strainer if applicable. • Use copper tube of the same diameter and length when replacing valve lines.
Fan Motor	Install a new capacitor.
Pump Motor	Install a new capacitor.
Thermistor	• Attach the new thermistor to the suction line in the same location as the previous thermistor. • The thermistor should be at the 12 o'clock position on the tube. • Smoothly fill the recessed area of the thermistor holder with high thermal conductive type sealant. Hoshizaki America part number 4A0683-01 (Silicone Heat Sink Compound 10-8108 manufactured by GC Electronics), KE-4560 RTV (manufactured by ShinEtsu Silicones), or equivalent are recommended. • Secure the thermistor with the holder, then insulate it. • Be very careful to prevent damage to the leads.

VI. Cleaning and Maintenance

This icemaker must be cleaned and maintained in accordance with the instruction manual and labels provided with the icemaker. Consult with your local Hoshizaki service center about cleaning and maintenance service.

⚠ WARNING
• Only qualified service technicians should service this icemaker. • **CHOKING HAZARD:** Ensure all components, fasteners, and thumbscrews are securely in place after any cleaning or maintenance is done to the icemaker. Make sure that none have fallen into the storage bin.

NOTICE
The storage bin is for ice use only. Do not store anything else in the storage bin.

A. Cleaning and Sanitizing Instructions

This icemaker must be cleaned and sanitized at least once a year. More frequent cleaning and sanitizing may be required in some water conditions.

⚠ WARNING
• To prevent injury to individuals and damage to the icemaker, do not use ammonia type cleaners. • Carefully follow any instructions provided with the bottles of cleaning and sanitizing solution. • Always wear liquid-proof gloves and goggles to prevent the cleaning and sanitizing solutions from coming into contact with skin or eyes.

NOTICE
To prevent damage to the water pump seal, do not operate the icemaker with the control switch in the "WASH" position when the water tank is empty.

1. Cleaning Procedure

1) Dilute 16 fl. oz. (473 ml) of Hoshizaki "Scale Away" with 3 gal. (11 l) of warm water.

2) Remove all ice from the evaporator and the storage bin.
Note: To remove cubes on the evaporator, remove the front panel and move the control switch to the "OFF" position. Wait 3 minutes, then move the control switch back to the "ICE" position and place the front panel back in its correct position. The harvest cycle starts and the cubes will be removed from the evaporator.

3) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.

4) Remove the insulation panel by lifting up the panel slightly and pulling it towards you.

5) Remove the base cover, then disconnect one end of the pump tubing to drain the water tank. See Fig. 5. After the water tank has drained, reconnect the pump tubing.

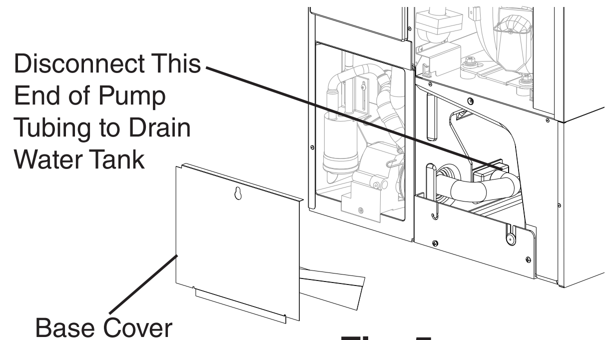


Fig. 5

6) In bad or severe water conditions, clean the float switch assembly as described below. Otherwise, continue to step 7.
   a. Disconnect the vent tube and the flush tube from the top of the float switch, then remove the float switch assembly. Remove the rubber boot from the bottom of the assembly
   b. Remove the retainer rod from the bottom of the float switch housing, then remove the float. Be careful not to bend the retainer rod excessively when removing it.
   c. Wipe down the float switch assembly's housing, shaft, float, and retainer rod with cleaning solution. Clean the inside of the rubber boot and hose with cleaning solution. Rinse the parts thoroughly with clean water.
   d. Reassemble the float switch assembly and replace it and the rubber boot in their correct positions. Reconnect the vent tube and the flush tube.

7) Pour the cleaning solution into the water tank.

8) Replace the insulation panel in its correct position.

9) Plug the icemaker back into the mains socket, then move the control switch to the "WASH" position to start the cleaning process.

10) Replace the front panel in its correct position.

11) After 30 minutes, remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.

12) Disconnect one end of the pump tubing to drain the water tank. After the water tank has drained, reconnect the pump tubing.

13) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position to fill the water tank with water.

14) Replace the front panel in its correct position.

15) After 3 minutes, remove the front panel.

16) Move the control switch to the "WASH" position to rinse off the cleaning solution.

17) Replace the front panel in its correct position.

18) After 5 minutes, remove the front panel.

19) Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.

20) Disconnect one end of the pump tubing to drain the water tank. After the water tank has drained, reconnect the pump tubing.

21) Repeat steps 13 through 20 three more times to rinse thoroughly.
Note: If you do not sanitize the icemaker, go to step 10 in "2. Sanitizing Procedure."

2. Sanitizing Procedure - Following Cleaning Procedure

1) Dilute 1.5 fl. oz. (44 ml) of a 5.25% sodium hypochlorite solution (chlorine bleach) with 3 gal. (11 l) of warm water.

2) Remove the insulation panel.

3) Pour the sanitizing solution into the water tank.

4) Replace the insulation panel in its correct position.

5) Plug the icemaker back into the mains socket, then move the control switch to the "WASH" position to start the sanitizing process.

6) Replace the front panel in its correct position.

7) After 15 minutes, remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.

8) Disconnect one end of the pump tubing to drain the water tank. After the water tank has drained, reconnect the pump tubing.

9) Repeat steps 13 through 20 in "1. Cleaning Procedure" two times to rinse thoroughly.

10) Replace the base cover in its correct position.

11) Clean the storage bin using a neutral cleaner. Rinse thoroughly after cleaning.

12) Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position to start the automatic icemaking process.

13) Replace the front cover in its correct position.

B. Maintenance

This icemaker must be maintained individually, referring to the instruction manual and labels provided with the icemaker.

⚠ WARNING
• Only qualified service technicians should service this icemaker. • Move the control switch to the "OFF" position and unplug the icemaker from the mains socket before servicing to prevent the power supply from being turned back on inadvertently.

1. Stainless Steel Exterior

To prevent corrosion, wipe the exterior occasionally with a clean, soft cloth. Use a damp cloth containing a neutral cleaner to wipe off oil or dirt buildup.

2. Storage Bin Scoop

- Wash your hands before removing ice from the storage bin. Use the plastic scoop provided (storage bin accessory).
- Clean the scoop using a neutral cleaner. Rinse thoroughly after cleaning.

3. Storage Bin

- The storage bin is for ice use only. Do not store anything else in the storage bin.
- Clean the storage bin liner using a neutral cleaner. Rinse thoroughly after cleaning.

4. Condenser

Check the condenser once a year, and clean the coil if required by using a brush or vacuum cleaner. More frequent cleaning may be required depending on location.

C. Preparing the Icemaker for Periods of Non-Use

NOTICE
• When storing the icemaker for an extended time or in sub-freezing temperatures, follow the instructions below to prevent damage. • To prevent damage to the water pump seal, do not operate the icemaker with the control switch in the "WASH" position when the water tank is empty.

When the icemaker is not used for two or three days under normal conditions, it is sufficient to move the control switch to the "OFF" position, When storing the icemaker for an extended time or in sub-freezing temperatures, follow the instructions below.

1. Remove the water from the icemaker water supply line:

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.
2) Close the icemaker water supply line shut-off valve and open the icemaker water supply line drain valve.
3) Allow the line to drain by gravity.
4) Attach a compressed air or carbon dioxide supply to the icemaker water supply line drain valve.
5) Make sure at least 3 minutes have elapsed since you unplugged the icemaker. Plug the icemaker back into the mains socket, then move the control switch to the "ICE" position. Replace the front panel in its correct position.
6) Blow the icemaker water supply line out using the compressed air or carbon dioxide supply.
7) Close the icemaker water supply line drain valve.

2. Drain the water tank:

1) Remove the front panel. Move the control switch to the "OFF" position, then unplug the icemaker from the mains socket.
2) Remove the base cover.
3) Disconnect one end of the pump tubing to drain the water tank. After the water tank has drained, reconnect the pump tubing. See Fig. 6.
4) Remove all ice from the storage bin. Clean the storage bin using a neutral cleaner. Rinse thoroughly after cleaning.
5) Replace the front panel in its correct position.

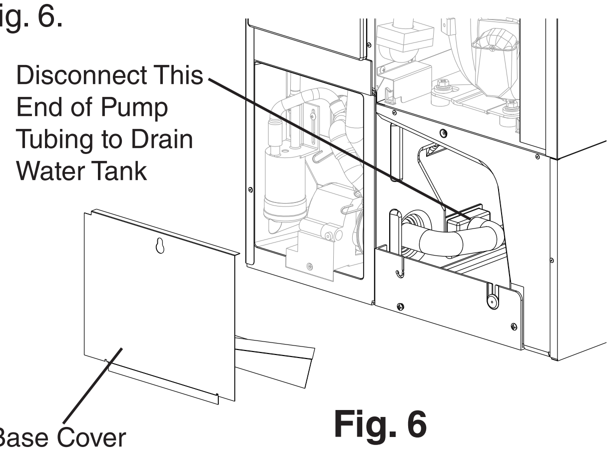


Fig. 6

VII. Disposal

This icemaker contains refrigerant and must be disposed of in accordance with applicable national, state, and local codes and regulations. Refrigerant must be recovered by properly certified service personnel.